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Effect Of Chlorhexidine Loading On Mechanical Properties Of Acrylic Reline Resins After Chemical Ageing

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RESUMO

Atualmente, em países desenvolvidos, a população está progressivamente a envelhecer. Portugal foi considerada a quarta economia mundial a envelhecer mais rapidamente, apenas atrás do Japão, da Coreia do Sul e da Espanha.

A perda de peças dentárias está associada a uma diminuição da integridade do sistema mastigatório, com consequências negativas em termos estéticos, funcionais e psicológicos. Neste sentido, a reabilitação com próteses removíveis continua a ser uma das opções mais procuradas pela população.

Em pacientes portadores de próteses removíveis, a progressiva reabsorção da crista alveolar é um problema devido à diminuição da adaptação da base da prótese aos tecidos subjacentes, podendo resultar em perda de retenção e de conforto e no desenvolvimento de lesões orais.

O procedimento mais comum para a correção dos problemas de adaptação das próteses removíveis é o rebasamento, no qual é colocado um material na base da prótese de forma a preencher o espaço entre o contorno da prótese removível e o contorno dos tecidos, melhorando a estabilidade, a retenção e o suporte e evitando o gasto de recursos económicos e de tempo como quando se realiza uma nova reabilitação protética.

Vários materiais podem ser utilizados nos procedimentos de rebasamento, tais como os silicones ou as resinas acrílicas. As resinas acrílicas, utilizadas pela maior parte dos profissionais, são biomateriais poliméricos que podem ser classificados em resinas acrílicas de rebasamento direto ou indireto, consoante o seu local de polimerização. As resinas acrílicas de rebasamento direto são compostas por um polímero em pó de poli(etil metacrilato) e um monómero na forma líquida, podendo ser isobutil metacrilato, butil metacrilato, 2-hidroxietilmetacrilato ou 1,6-hexanodioldimetacrilato. As resinas acrílicas de rebasamento indireto, por sua vez, são constituídas pelo polímero poli(metil metacrilato) e o monómero metil metacrilato.

Estes materiais apresentam boas características, tais como boa condutividade térmica, baixo custo e fácil manipulação. Contudo, o odor desagradável e as alterações na coloração são consideradas desvantagens. O facto de serem materiais porosos promove o aumento da suscetibilidade para colonização microbiana, devido a um aumento da rugosidade e das irregularidades, e o desenvolvimento de doenças orais, como a estomatite protética.

A estomatite protética é observada em 25% a 70% dos pacientes portadores de próteses removíveis e é caracterizada por uma inflamação generalizada e difusa da mucosa palatina que se encontra coberta pela prótese. É, normalmente, uma condição assintomática, embora alguns pacientes possam relatar queixas de dor, prurido ou ardor.

Embora a etiologia seja multifatorial, a infeção aparenta ser causada por um aumento quantitativo de espécies de *Candida*, especialmente *Candida albicans*, um fungo comensal que pode atuar como microrganismo oportunista. Neste caso, a sua aderência a células do hospedeiro ou a materiais dentários é um passo essencial para o desenvolvimento da infeção. Vários fatores locais e sistémicos estão, também, relacionados com esta patologia.

O tratamento é complexo e, normalmente, inclui terapêuticas antifúngicas tópicas ou sistémicas, a redução do tempo de utilização das próteses ou a modificação da base da prótese com materiais de rebasamento, entre outros.

Existem vários agentes antimicrobianos disponíveis para o tratamento de infeções fúngicas, como o fluconazol, a nistatina ou a equinocandina. Contudo, estas abordagens terapêuticas verificaram-se ineficazes, devido à baixa cooperação do paciente, ao *turnover* salivar e à criação de resistências contra estes agentes antimicrobianos.

Uma nova estratégia de tratamento tem vindo a ser desenvolvida. Dispositivos médicos, como as resinas acrílicas de rebasamento, são utilizados como reservatórios de agentes antimicrobianos, permitindo a libertação contínua de fármacos nos locais de infeção, com risco mínimo de níveis subterapêuticos ou de toxicidade sistémica.

A clorexidina (CHX) é um agente com elevada substantividade e propriedades antifúngica, antibacteriana e antibiofilme contra um grande número de microrganismos, incluindo *Candida albicans*. É uma molécula carregada positivamente que se liga à parede celular deste fungo, destabilizando-a, interferindo com a osmose e provocando a sua morte.

A CHX foi estudada na incorporação em resinas acrílicas de rebasamento. Apresenta, de forma interessante, um padrão de libertação que traduz uma elevada libertação inicial, nos primeiros 2 a 7 dias, seguida de um período de libertação constante até, pelo menos, 28 dias.

Os alimentos e as bebidas podem afetar os materiais dentários e alterar os valores de pH da cavidade oral. Estudos indicam que um indivíduo com uma dieta cariogénica é submetido, diariamente, a aproximadamente 6 horas de ambiente ácido. Adicionalmente, em casos de estomatite protética, o pH da cavidade oral é mais baixo (aproximadamente pH=5,2). Assim, é importante simular as condições da cavidade oral nos estudos com resinas acrílicas de rebasamento.

Vários estudos foram promissores, já que estabeleceram as concentrações de CHX que têm, simultaneamente, atividade antifúngica e não influenciam as propriedades das resinas acrílicas. Contudo, os estudos apenas foram conduzidos após envelhecimento térmico. Assim, o conhecimento atual em relação à influência do envelhecimento químico nos biomateriais permanece escasso.

O objetivo desta investigação foi o de avaliar o efeito da incorporação de CHX na microdureza e na resistência à flexão de três resinas acrílicas de rebasamento, após um processo de envelhecimento químico de 28 dias.

Três resinas acrílicas de rebasamento foram avaliadas: duas resinas de rebasamento direto (*Kooliner* e *Ufi Gel Hard*) e uma resina de rebasamento indireto (*Probase Cold*). Para cada material, estabeleceram-se dois grupos: um grupo de controlo, representado pela concentração de 0% de CHX, e um grupo de teste, com uma concentração de CHX incorporada em cada resina acrílica de rebasamento (*Kooliner* – 2,5%; *Ufi Gel Hard* – 5%; *Probase Cold* – 5%). A concentração de CHX foi calculada relativamente à massa de pó de cada material. Para cada grupo de resina acrílica de rebasamento, foram preparados oito espécimes, recorrendo a moldes retangulares de aço inoxidável, com dimensões aproximadas de 64×10×3,3mm.

Foram preparados um total de 48 espécimes. Os espécimes foram, depois, submetidos a um protocolo de envelhecimento químico durante 28 dias, que consistia em variações de pH em saliva artificial, com ciclos de 6 horas em pH=3 e 18 horas em pH=7.

Ao fim de 1 (168 horas), 2 (336 horas), 3 (504 horas) e 4 semanas (672 horas), todos os espécimes foram testados recorrendo ao teste de microdureza de *Knoop*, tendo cada teste a duração de 30 segundos e uma força aplicada de 98,12mN. Foram realizadas 12 medições por espécime e, dos valores obtidos, foi calculada a média dos valores de microdureza de cada espécime.

Ao fim de 4 semanas (672 horas), os espécimes foram também sujeitos a um teste de resistência à flexão de três pontos, utilizando uma máquina de testes universal.

Foi realizada a análise descritiva dos valores de microdureza e de resistência à flexão e determinaram-se os valores de média, desvio-padrão, mediana e amplitude interquartil.

Após análise através do *software* SPSS *Statistics* (SPSS Inc., Chicago, IL., EUA), verificou-se que os dados não apresentavam uma distribuição normal para as variáveis em estudo (verificação feita através dos testes *Kolmogorov-Smirnov* e *Shapiro-Wilk*). Os resultados foram, então, submetidos a testes não paramétricos, de acordo com o método de *Mann-Whitney*, para determinar se existiam diferenças estatisticamente significativas entre os grupos de cada

material testado. Para todos os testes estatísticos realizados, foi utilizado um valor de significância de 5% (p=0,05).

Em relação à incorporação de diferentes concentrações de CHX nos valores de microdureza, não se verificaram diferenças estatisticamente significativas entre nenhum grupo dos três materiais testados (*Kooliner* – p=0,753; *Ufi Gel Hard* – p=0,875; *Probase Cold* – p=0,172).

No que concerne aos valores de resistência à flexão, os grupos de *Kooliner* (p=0,916) e *Ufi Gel Hard* (p=0,600) não apresentaram diferenças estatisticamente significativas. Contudo, verificaram-se valores de resistência à flexão menores (p=0,021) no grupo com 5% de CHX incorporada em *Probase Cold*, quando comparado com o grupo de controlo.

A presença física das partículas de CHX pode provocar alterações nas cadeias poliméricas, já que a incorporação de fármacos aumenta a distância intermolecular entre os monómeros e aumenta a quantidade de monómero residual, levando a uma menor resistência à flexão.

É importante não esquecer que *Kooliner* e *Ufi Gel Hard* são resinas acrílicas de rebasamento direto com composição química semelhante, ao invés de *Probase Cold*, uma resina acrílica de rebasamento indireto que apresenta diferenças estruturais e químicas das anteriores. Trata-se de um material de rebasamento menos poroso e com ligações químicas menos complexas. A CHX pode, então, ficar retida nos espaços da rede polimérica e a resistência à flexão do material pode ser prejudicada.

Conclui-se que, após um processo de envelhecimento químico de 28 dias, não se verificou uma influência negativa nos valores de microdureza dos três materiais testados. Relativamente aos valores de resistência à flexão, as proporções de 2,5% de CHX em *Kooliner* e de 5% de CHX em *Ufi Gel Hard* não revelaram influenciar esta propriedade nestes materiais. Contudo, a incorporação de 5% de CHX em *Probase Cold* mostrou influenciar negativamente a resistência à flexão, com valores significativamente menores, quando comparado com o grupo de controlo.

Para estudos futuros, será importante estudar estas e outras propriedades físicas e mecânicas das resinas acrílicas após incorporação de CHX, não apenas após envelhecimento químico, mas também após uma combinação de envelhecimentos térmico e químico.

PALAVRAS-CHAVE

Clorexidina; dureza; estomatite protética; resinas acrílicas; resistência à flexão.

ABSTRACT

The objective of the present investigation was to evaluate the effect of the incorporation of chlorhexidine (CHX) on the microhardness and flexural strength of three acrylic reline resins (*Kooliner*, *Ufi Gel Hard* and *Probase Cold*), after a 28-day chemical ageing process.

Three acrylic reline resins were incorporated with different concentrations of CHX (*Kooliner* – 2.5%; *Ufi Gel Hard* – 5%; *Probase Cold* – 5%). Control groups were represented by the concentration of 0% CHX. Specimens with 64×10×3.3mm were submitted to a chemical ageing process for 28 days, which consisted of pH variations in artificial saliva, with cycles of 6 hours at pH=3 and 18 hours at pH=7. A total of 48 specimens were prepared (eight specimens of each concentration).

At 1 (168 hours), 2 (336 hours), 3 (504 hours) and 4 weeks (672 hours), all specimens were evaluated by the Knoop microhardness test (98.12mN for 30 seconds). Twelve measurements were taken on each specimen. After 4 weeks (672 hours), the flexural strength of the specimens was tested using a three-point bending device.

The results were submitted to non-parametric tests, according to the Mann-Whitney method, considering a significance level of 5% (p=0.05).

After submitted to a chemical ageing process, the incorporation of CHX in the specimens showed no effect on microhardness values (p>0.05). Regarding flexural strength, specimens of *Kooliner* and *Ufi Gel Hard* showed no statistically significant differences (p>0.05). However, *Probase Cold* specimens with 5% CHX incorporated showed lower flexural strength values as compared to the control group (p=0.021).

After chemical ageing, there is no decrease in the microhardness values of acrylic resins incorporated with CHX. However, the concentration of 5% CHX incorporated in *Probase Cold* specimens negatively affects the flexural strength values.

KEYWORDS

Acrylic resins; chlorhexidine; denture stomatitis; flexural strength; hardness.

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b	Specimen's width
CHX	Chlorhexidine
d	Specimen's thickness
FS	Flexural strength
HCl	Hydrochloric acid
IQ	Interquartile range
K	*Kooliner*
KHN	Knoop hardness number
l	Distance between supports
LI	Liquid
M	Mean
MED	Median
MIC	Minimum inhibitory concentration
P	Powder
PC	*Probase Cold*
rpm	Rotations per minute
SD	Standard deviation
UG	*Ufi Gel Hard*
W	Maximum load before fracture

1. INTRODUCTION

Nowadays, in developed countries, the population is progressively ageing. (1) Dated from 2015, the *World Population Prospects* report, from the United Nations, places Portugal as the fourth economy in the world, which is getting old more rapidly, only behind Japan, South Korea and Spain. (2)

Tooth loss is associated with a decrease in the integrity of the masticatory system and negative consequences in aesthetic, functional and psychological terms. (3) As a result of the increase in average life expectancy, population ageing and world economy, rehabilitation with removable dentures will continue to be one of the most sought options by the population (4), allowing the reestablishment of function, speech and lost vertical dimension as well as aesthetic improvement. (5-6)

In patients using removable dentures, progressive resorption of the alveolar ridge is a problem, as changes in soft and bone tissues gradually diminish adaptation of the denture base to the underlying tissues, resulting in loss of retention and comfort during its use and possible development of mucosal lesions. (7) In addition, it is believed that about two-thirds of the patients observed develop clinically unstable dentures. (7) Thus, it is important to conduct a periodic examination in order to analyze any changes in the adaptation of removable dentures to the underlying mucosa. (1,8-9)

The most common procedure that solves this problem is the relining, which consists in placing a material in the base of the denture that fills the space between the original contour of the denture and the contour of the tissues. (10-12) It is described as an effective technique to improve stability, retention, support and function of the denture, as well as to avoid the development of future tissue lesions and the expense of money and time in new prosthetic rehabilitations. (10,11,13-17)

Several materials can be used, like tissue conditioners and acrylic resins. (18-19) These last polymeric biomaterials are, usually, chosen by the majority of professionals, since have good thermal conductivity, low price and are easy to handle. (20)

The acrylic reline resins may be divided into direct (or chairside) or indirect (or laboratory) reline materials. (12) The composition of the indirect acrylic reline resins consist of a poly(methyl methacrylate) polymer and methyl methacrylate monomer. (21) In order to allow polymerization in the patient's oral cavity, direct acrylic reline resins were created based on a poly(ethyl methacrylate) powder, whereas the liquid composition varies between the monomers

isobutyl methacrylate, butyl methacrylate, 2-hydroxyethylmethacrylate or 1,6-hexanodioldimethacrylate. (21)

These polymeric materials also present some disadvantages, such as unpleasant odor and changes in color, caused by their porous structure. Also, they can contribute to a chemical irritation of the oral mucosa and increase of susceptibility to microbial colonization and subsequently the development of oral diseases, such as denture stomatitis. (6,8,22-25)

Denture stomatitis is one of the most common pathological conditions for denture wearers. (26-27) According to the literature, this condition, observed in 25% to 70% of patients using removable dentures, is characterized by a generalized and diffuse inflammation of the palatal mucosa that is covered by the denture. (18,28-30) Usually, this condition is asymptomatic, although some patients report complaints of pain, itching or a burning sensation. (31)

Although the etiology is multifactorial, denture stomatitis appears to be related to a quantitative increase of yeasts on the mucosa and the surface of the denture, particularly *Candida* species, such as *Candida tropical*, *Candida krusei*, *Candida guilliermondis*, *Candida parapsilosis*, *Candida glabrata* and, specially, *Candida albicans*. (28,30,32-34) It is a commensal fungal organism, which can act as an opportunistic pathogen. (35-36) It may be considered the main etiological factor, being its adherence to host cells or dental biomaterials, such as acrylic resins, an essential step in the development of the infection. (39-41)

Local host factors are also related to this pathology, such as local trauma caused by maladaptive dentures and their continuous use, decreased salivary flow due to medication or radiotherapy, changes in salivary pH and poor oral hygiene. Systemic factors like use of antibiotics, decreased host immune response, other microbial infections and nutritional deficiencies are also considered important factors. (23,27,39,42-50)

Biofilm is a complex and well-structured community of microorganisms, surrounded by a matrix of extracellular polymers, adhered to biotic or abiotic surfaces, such as teeth or denture surfaces. These communities have unique characteristics that confer survival and pathogenicity, allowing defense against harmful physical and chemical factors, reduction of metabolic activity and protection against host defenses, as well as hinder the diffusion of antibiotics, increasing the resistance of microorganisms to their action. (39,50-53)

The materials used in removable dentures, such as acrylic resins, represent a perfect support for biofilm formation. The physical and chemical characteristics of the surface of these materials allow the formation of biofilm through reversible adhesion and, later, irreversible to its surface. (37,54)

Due to the intrinsic porous nature of acrylic resins, surface deterioration, promoted by oral hygiene procedures and the proper feeding or chewing activity (55-57), can easily increase roughness and influence the tendency for adhesion of pathogenic microorganisms. Denture bases can function as reservoirs of microorganisms, which may contribute to the development of denture stomatitis, as mentioned. (58-60)

Treatment of this pathology is complex and, usually, includes mechanical and chemical control of dental plaque, reduce of denture wearing time, nutritional restitution, cleaning and modification of the denture base with a relining material, topical or systemic antifungal therapies and, in the last case, replacement of the denture. (23,32,47,52,61-63)

There are a reasonable number of antimicrobial agents available for the treatment of fungal infections. Fluconazole, a systemic antifungal, is widely used in the treatment of infections caused by *Candida*, as it is well tolerated and has low toxicity and few side effects. Nevertheless, only a small concentration tends to reach the target site and its biofilm efficacy is relatively low, which may lead to an increased risk for selection and development of resistant species, especially in elderly patients with reduced saliva production. In addition, some strains of *Candida albicans* and other *Candida* species present in this condition are resistant to azoles. Therefore, it is recommended the initial application of another strategy or prevention therapy and the application of fluconazole only in cases of immunodeficiency or in severe cases of denture stomatitis. (28,32,35,39,51-53,63-64) On the other hand, nystatin and echinocandin are highly effective agents against *Candida* (planktonic and biofilm forms). Despite its efficacy and few drug interactions, the recommended treatment with nystatin includes daily intakes of four doses, representing a significant challenge to patient's compliance, in addition to the toxicity problems it can trigger. (28,32,53,64-66) Also, echinocandin is only available in intravenous formulations. (32)

The existing therapeutic approaches are, therefore, inefficient. (67-68) Currently, the action of the drug is obtained by the periodic and non-specific application of the agent, either topically or systemically. This method may lead to undesirable side effects at the target site and at the surrounding environment. Topical application is, usually, related to lack of compliance by the patient (because it is a pathological condition that tends to be relatively painless), difficulty in placing the appropriate dose of drug in the desired location and in maintaining it for the period of time sufficient for the maximum therapeutic potential due to the turnover effect of saliva. (64,69-73) In addition, recurrence of denture stomatitis tends to be rapid, unless denture surface is modified to eliminate *Candida* hyphae. (74) Even when hygiene solutions

are used to clean the denture, *Candida albicans* tends to subsist, as these species appears to penetrate the acrylic reline resins. (18,34,75)

The emergence of a new strategy in which dental medical devices, such as soft bases or acrylic reline resins, act as reservoirs of antimicrobial agents has been suggested for, potentially, preventing microbial adherence. (54,76) The use of drug delivery systems, in addition to requiring minimal intervention and monitoring, allows continuous release of drugs at the site of infection, with minimal risk of subtherapeutic levels or systemic toxicity. (28,64,77) When incorporated into relining materials, it works as a treatment simultaneously for maladaptive dentures and for *Candida albicans*-related infections since they are able to exceed the minimum inhibitory concentration (MIC) of this fungus. (64,78-79)

Several compounds have been incorporated, such as fluconazole (64), silver-zinc zeolite (60), fluoralkyl methacrylate (80), methacryloyloxyundecylpyridinium bromide (81) or titanium dioxide or silicon dioxide nanoparticles. (82)

Chlorhexidine (CHX) is a widely used antiseptic agent, with high substantivity and antifungal, antibacterial and antibiofilm properties against a large number of microorganisms, including *Candida* species. (32-33,53,69,83) It is a positively charged molecule that binds to negatively charged groups in the cellular wall of *Candida albicans*, destabilizing it and interfering with osmosis, causing intracellular content leakage and cell death. (64,84-85) Therefore, it is capable of suppressing its adherence to buccal epithelial cells or surfaces of acrylic resins, reducing biofilm formation and disrupting preformed biofilm and, thereby, inhibiting *Candida*-related infections. (33,35-36,39,52-53)

CHX has also been studied for incorporation into resins (28,32-33,36,39,53,64,86) and showed an interesting release pattern: a high release in the first 2 to 7 days which decreases and remains constant for, at least, 28 days. (34,46,79) In addition, CHX had good results in both release and microbiological tests when compared to other agents, such as fluconazole or nystatin. (28,32-33,39,53,59,64) The development of resistant yeasts has not yet been observed. (32-33,53,64,87)

Many microbiological studies showed that, when incorporated into acrylic resins, the concentration of 10% (*w*/*w*) of CHX is the most effective against *Candida albicans*. (32-33,53,69) However, according to the preliminary results of a study, the incorporation of the concentration of 2.5% (*w*/*w*) of CHX in the acrylic reline resin *Kooliner* and 5% (*w*/*w*) of CHX in *Ufi Gel Hard* and *Probase Cold* appear to be sufficient to inhibit the proliferation and development of *Candida albicans*. (88)

Food and drinks can affect dental materials through the direct effect of their additives, such as ethanol, and their ability to alter intraoral pH values. (89) Several studies used distilled water or artificial saliva at pH=7 as a solution medium to investigate drug release, but only a few of them tested the release in artificial saliva with different pH values. (36,83,90-93) It is important to simulate the conditions of the oral cavity, since it is exposed to endogenous and exogenous acids. (94) Previous studies indicate that an individual, with a cariogenic diet, is subjected daily to approximately 6 hours of acidic environment. (95-96) In addition, in cases of denture stomatitis, the pH of the oral cavity is lower than neutral (approximately pH of 5.2). (49) Saliva is mainly composed of water and is one of the main factors responsible for biodegradation. The oral environment necessarily facilitates the sorption of water from the saliva to the acrylic resin, which is a polar material. The water molecules can easily penetrate the polymer network, allowing diffusion of residual monomers and/or additives from the material. (97-99) This elution will leave porosities, which may affect physical and mechanical properties (88), such as microhardness and flexural strength. Oral biomaterials are submitted to biodegradation processes that can change the physical and mechanical properties, being extremely important to mimic the oral cavity conditions through ageing processes. (68)

Previous studies, in which CHX was incorporated into acrylic reline resins, were promising because they established CHX concentrations that had antifungal activity but did not influence the properties of the resins. (67-68,72-73,88,91,100-102) Other studies have evaluated the influence of the incorporation of CHX on acrylic reline resins without any associated ageing or after thermal ageing (temperature changes). Despite this knowledge, there is a lack of literature regarding the influence of chemical ageing, through pH variations, on the properties of biomaterials.

This investigation intends to clarify the behavior of acrylic reline resins after pH changes, simulating the oral cavity environment, since there is little evidence available.

2. OBJECTIVES

The first main objective of this study was to evaluate the effect of loading three acrylic reline resins with a concentration of CHX on the microhardness, after undergoing a chemical ageing process, according to the following hypotheses:

$H0_1$: Loading *Kooliner* with 2.5% CHX doesn't affect the microhardness of the acrylic reline resin.

$H1_1$: Loading *Kooliner* with 2.5% CHX affects the microhardness of the acrylic reline resin.

$H0_2$: Loading *Ufi Gel Hard* with 5% CHX doesn't affect the microhardness of the acrylic reline resin.

$H1_2$: Loading *Ufi Gel Hard* with 5% CHX affects the microhardness of the acrylic reline resin.

$H0_3$: Loading *Probase Cold* with 5% CHX doesn't affect the microhardness of the acrylic reline resin.

$H1_3$: Loading *Probase Cold* with 5% CHX affects the microhardness of the acrylic reline resin.

The second main objective of this study was to assess the effect of the incorporation of a concentration of CHX on the flexural strength of three acrylic reline resins, after undergoing a chemical ageing process, according to the following hypotheses:

$H0_4$: Loading *Kooliner* with 2.5% CHX doesn't affect the flexural strength of the acrylic reline resin.

$H1_4$: Loading *Kooliner* with 2.5% CHX affects the flexural strength of the acrylic reline resin.

$H0_5$: Loading *Ufi Gel Hard* with 5% CHX doesn't affect the flexural strength of the acrylic reline resin.

$H1_5$: Loading *Ufi Gel Hard* with 5% CHX affects the flexural strength of the acrylic reline resin.

$H0_6$: Loading *Probase Cold* with 5% CHX doesn't affect the flexural strength of the acrylic reline resin.

$H1_6$: Loading *Probase Cold* with 5% CHX affects the flexural strength of the acrylic reline resin.

3. MATERIALS AND METHODS

In the present investigation, three auto-polymerizing acrylic reline resins (**Table 1** | **Figures 1**–**3**), presented in powder-liquid formulations, were selected because of their differences in terms of chemical composition.

Two of these acrylic reline resins are direct reline resins: ***Kooliner*** (GC America Inc., Alsip, IL., USA), a non-crosslinking material, and ***Ufi Gel Hard*** (Voco GmbH., Cuxhaven, Germany), a crosslinking material, both composed of pre-polymerized poly(ethyl methacrylate) powder particles and the monomers isobutyl methacrylate and 1,6-hexanodioldimethacrylate, respectively.

The third acrylic reline resin is an indirect reline resin: ***Probase Cold*** (Ivoclar Vivadent AG., Liechtenstein), composed of poly(methyl methacrylate) powder particles and methyl methacrylate as the monomer. (103-104)

TABLE 1. Materials under evaluation in this investigation.

MATERIAL	*MAIN COMPOSITION*		*P/LI RATIO* (g/mL)	*CURING CYCLE*	*MANUFACTURER*	*BATCH NUMBER (EXPIRATION DATE)*	
	P	*LI*				*P*	*LI*
***KOOLINER* (K)**	PEMA	IBMA	1.4/1	10 minutes 37ºC	GC America Inc., Alsip, IL., USA	1707271 (27/07/2020)	1608021 (08/2019)
***UFI GEL HARD* (UG)**	PEMA	1,6-HDMA	1.77/1	7 minutes 37ºC	Voco GmbH., Cuxhaven, Germany	1816582 (09/2020)	1804406 (02/2020)
***PROBASE COLD* (PC)**	PMMA	MMA	1.5/1	15 minutes 40ºC 4 bar	Ivoclar Vivadent AG., Liechtenstein	WT0487 (21/08/2021)	W85050 (01/10/2021)

P = Powder; **LI** = Liquid; **PEMA** = Poly(ethyl methacrylate); **PMMA** = Poly(methyl methacrylate); **IBMA** = Isobutyl methacrylate; **1,6-HDMA** = 1,6-hexanodioldimethacrylate; **MMA** = Methyl methacrylate.

The CHX selected for the investigation was chlorhexidine diacetate monohydrate (Panreac Applichem, Darmstadt, Germany), with a batch number of 8F015944 and an expiration date of 10/2023 (**Figure 4**).

FIGURES 1–4. Materials under evaluation in this investigation: **1)** *Kooliner*; **2)** *Ufi Gel Hard*; **3)** *Probase Cold*; **4)** Chlorhexidine diacetate monohydrate.

3.1. PREPARATION OF THE SPECIMENS

The acrylic reline resins were manipulated according to the manufacturers' instructions (**Table 1**). The powder of acrylic reline resin and CHX were weighted using a precision balance (A&D Company, Limited, Tokyo, Japan) (**Figure 5**) and the liquid was measured using a graduated pipette.

On the experimental specimens, CHX, according to the proportions established, was incorporated and mixed with the powder of each acrylic reline resin, using a mortar and a pestle for homogenization (**Figures 6-7**). Control groups were not loaded with CHX and were represented as 0% CHX group.

Therefore, in the acrylic reline resin *Kooliner*, the concentration of CHX of 2.5% (*w/w*) was loaded in the resin, while in the acrylic reline resins *Ufi Gel Hard* and *Probase Cold*, the concentration of CHX of 5% (*w/w*) were incorporated. Eight specimens of each group (n=8) were prepared.

FIGURE 5. Precision balance (A&D Company, Limited, Tokyo, Japan).

FIGURE 6. Pestle and mortar used for homogenization.

FIGURE 7. Homogenization of CHX with the powder of the acrylic reline resin.

Specimens of each material were prepared from rectangular shaped stainless moulds. (105) For the preparation of each specimen, the stainless-steel mould was placed on a glass plate covered by a polyester sheet (**Figure 8**). The materials were prepared following the manufacturers' instructions (**Table 1**) and placed into the mould. Another polyester sheet and glass plate were positioned on the mould (**Figure 9**).

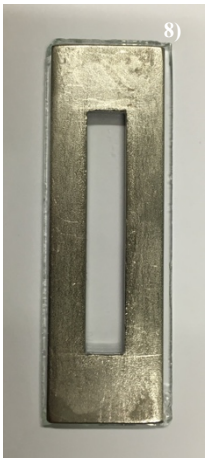


FIGURE 8. Stainless-steel mould placed on glass plate covered by a polyester sheet.

FIGURE 9. Mixture and mould between polyester sheets and glass plates.

During the recommended polymerization time of the direct acrylic reline resins (**Table 1**), specimens were maintained under compression at 37±2ºC, in order to simulate the intraoral polymerization conditions of the materials (Ehret, Mahlberg, Germany) (**Figure 10**).

Polymerization of the indirect acrylic reline resin was carried out in a pressure device (Ivomat, Ivoclar Vivadent, Liechtenstein) (**Figure 11**) at recommended time, temperature and pressure (**Table 1**).

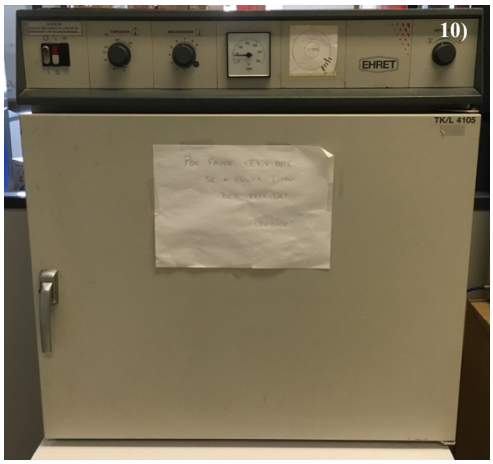


FIGURE 10. Stove to maintain specimens at 37±2ºC (Ehret, Mahlberg, Germany).

FIGURE 11. Pressure device (Ivomat, Ivoclar Vivadent, Liechtenstein).

After polymerization, specimens were removed from the moulds and all the irregularities of each sample were polished with a 600-grit silicon carbide paper (Carbimate Paper Discs, Buehler Ltd., Lake Bluff, IL., USA), by a polisher with constant refrigeration (**Figures 12-13**). Each specimen had, approximately, 64×10×3.3mm. A total of forty-eight specimens were prepared.

FIGURE 12. Polishing of the irregularities of a sample.

FIGURE 13. Example of a polymerized *Probase Cold* (PC) specimen.

3.2. PREPARATION OF THE MEDIUM SOLUTIONS

The medium solution used in the present investigation was artificial saliva at pH=3 and at pH=7. It was prepared according to a Faculty of Pharmacy – University of Lisbon formula, courtesy of Joana Marto:

1. Boiling 50mL (F12 – ED Refrigerated/Heating Circulator) of phosphate buffer at pH=7 (anhydride disodium phosphate, monosodium phosphate anhydride and deionized water), at 60ºC;
2. Sprinkling 0.05g of xanthan gum into boiling buffer and stirring until total of xanthan gum was dissolved;
3. Dissolving 0.04g of calcium chloride dihydrate (EW – N/EG – N balance), 0.08g of sodium chloride and 0.08g of potassium chloride in solution 2 and stirring until total of materials were dissolved;
4. Dissolving 15g of propylene glycol in solution 3 and stirring until total of propylene glycol was dissolved;
5. Pouring the solution 4 into a graduated beaker and complete the solution with phosphate buffer at pH=7 to 100mL;
6. Adjusting the pH (Crison Micro pH 2001, Hach Lange, Barcelona, Spain) (**Figure 14**) of artificial saliva to pH=3 with HCl 1M.

Solutions were kept out of light, at room temperature.

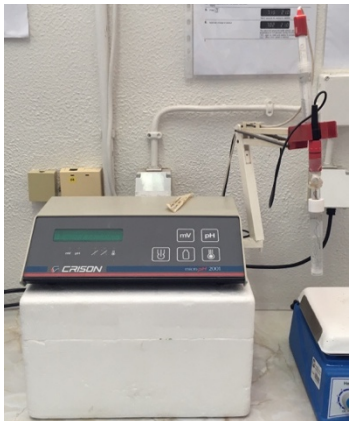


FIGURE 14. pH meter (Crison Micro pH 2001, Hach Lange, Barcelona, Spain).

3.3. CHEMICAL AGEING PROTOCOL

A preliminary study was performed to optimized further experimental protocols.

Specimens were weighted (A&D Company, Limited, Tokyo, Japan) and stored individually in graduated falcon tubes of 15mL and immersed in artificial saliva, with a ratio of 1g/5mL (**Figure 15**).

In order to simulate oral conditions, samples were assigned to a protocol of chemical ageing, based on cycles of 6 hours in artificial saliva at pH=3 interchanging with 18 hours in artificial saliva at pH=7. Between each change, samples were washed with distilled water and dried with absorbent paper. Therefore, all the six experimental groups (*n*=8) were submitted to an ageing period of 28 days (672 hours).

Falcon tubes were placed into an incubator at 37ºC (Memmert, Schwabach, Germany) with constant gentle shaking (300 rpm) (**Figure 16**).

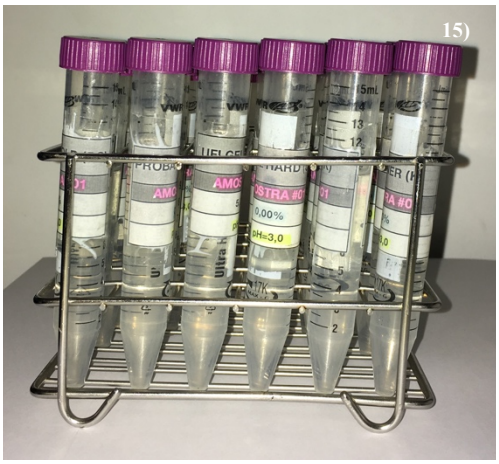
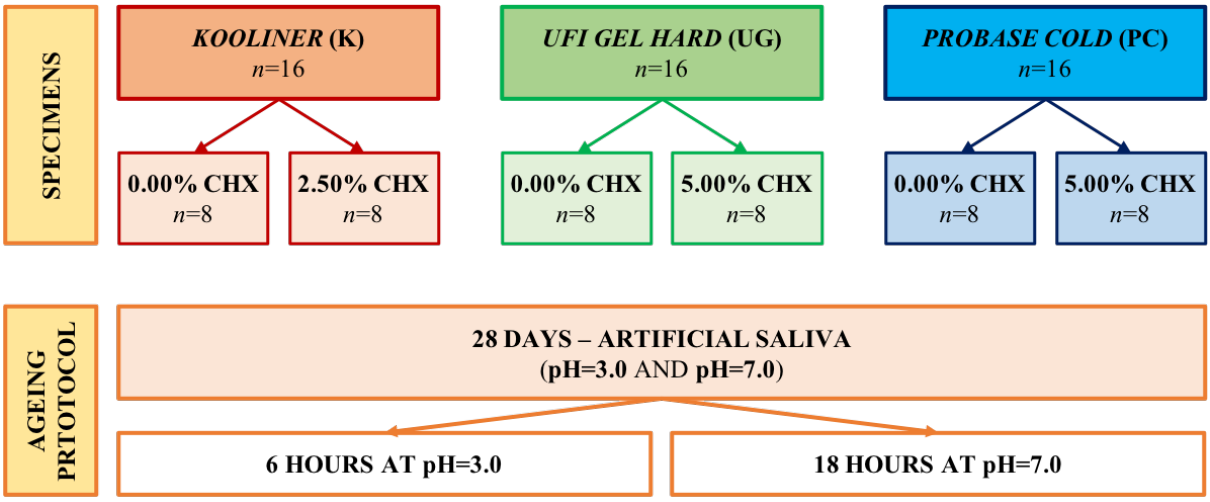


FIGURE 15. Incubation of the specimens in graduated falcon tubes with artificial saliva.

FIGURE 16. Incubator (37ºC, with constant gentle shaking – 300 rpm) (Memmert, Schwabach, Germany).

At specific time intervals (1 week – 168 hours, 2 weeks – 336 hours, 3 weeks – 504 hours and 4 weeks – 672 hours), microhardness of the specimens were measured. At the end of the ageing period (4 weeks – 672 hours), the flexural strength values of the specimens were also obtained (**Figure 17**).



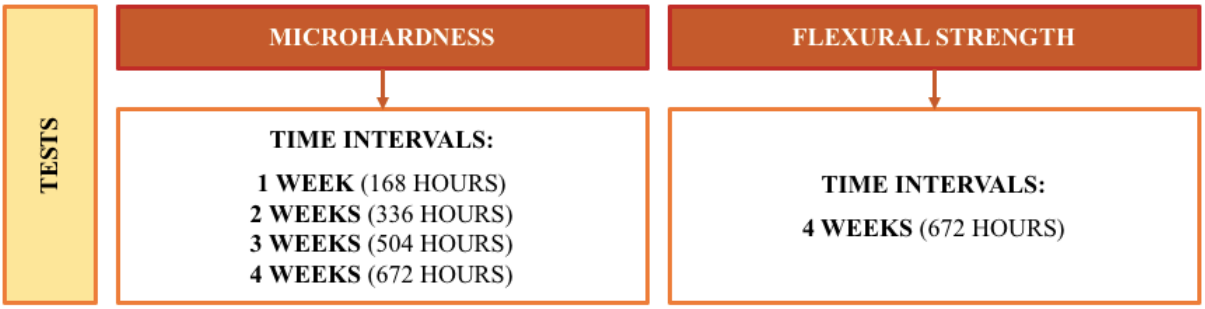


FIGURE 17. Schematization of the protocol of the study.

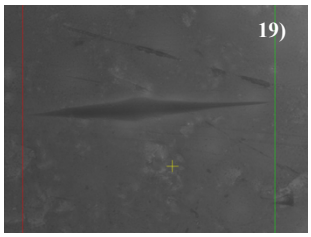
3.4. MICROHARDNESS TEST

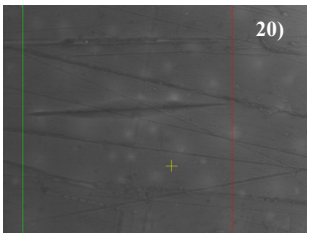
Microhardness of all specimens was obtained using a microhardness indentation machine (Duramin, Struers DK 2750, Balleruo, Denmark) (**Figure 18**) with a Knoop diamond indenter, with an elongated pyramid's shape. Microhardness test parameters were 98.12mN load for 30 seconds.

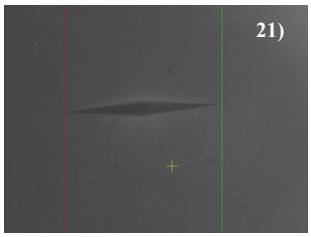
Using the Duramin software, after each indentation, the length of the pyramidal indentations was immediately measured by the operator with a 40× objective, on a maximum period of 10 seconds (**Figures 19-24**). The conversion of these measurements into Knoop hardness number (KHN) were made automatically by the equipment.

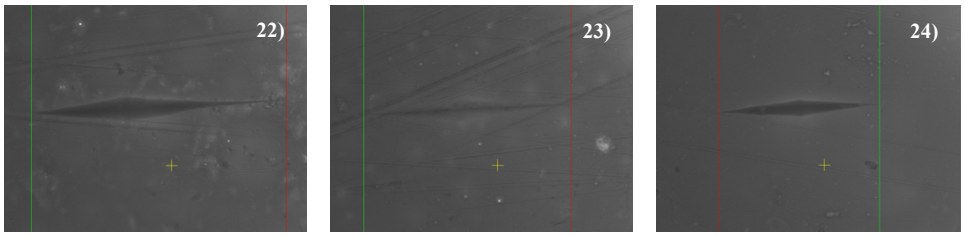
Twelve equidistant measurements were made in each specimen after 1 (168 hours), 2 (336 hours), 3 (504 hours) and 4 weeks (672 hours) of chemical ageing.

FIGURE 18. Microhardness indentation machine (Duramin, Struers DK 2750, Balleruo, Denmark).









FIGURES 19-24. Microscopic image of a Knoop indentation on a specimen of: **19)** *Kooliner* – control group; **20)** *Ufi Gel Hard* – control group; **21)** *Probase Cold* – control group; **22)** *Kooliner* – 2.5% CHX; **23)** *Ufi Gel Hard* – 5% CHX; **24)** *Probase Cold* – 5% CHX.

3.5. FLEXURAL STRENGTH TEST

After 28 days (672 hours) of chemical ageing, a servo-hydraulic testing machine (Instron, Model 4502, Norwood, MA., USA) (**Figure 25**) was used to perform flexural strength tests using a three-point bending device. Firstly, width and thickness were measured in each specimen with a digital micrometre of ±0.01mm precision (Mitutoyo Digimatic, MFG. Co. Ltd., Tokyo, Japan). Then, their averages were introduced in the software just before testing.

A crosshead speed of 5mm per minute was selected and the distance between supports was 50mm. (105) Load was applied until failure (**Figure 26**) and the fracture load was recorded in Newton (N). The flexural strength was expressed in megapascal (MPa) and calculated using the formula:

$$FS = \frac{3Wl}{2bd^2}$$

Where **FS** is the flexural strength, **W** is the maximum load before fracture (N), **l** is the distance between supports (50mm), **b** is the specimen's width (mm) and **d** is the specimen's thickness (mm).

FIGURE 25. Servo-hydraulic testing machine (Instron, Model 4502, Norwood, MA., USA).

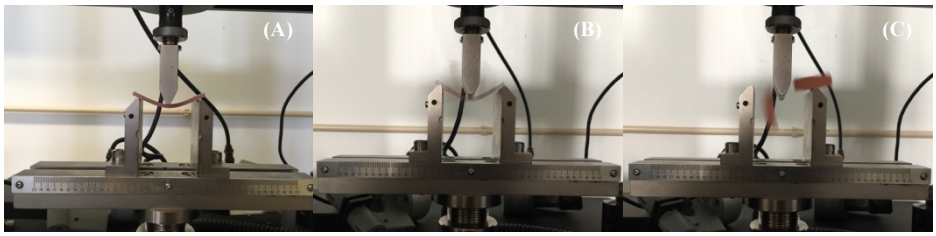


FIGURE 26. Specimen submitted to three-point loading flexural strength test in a universal machine.

3.6. STATISTICAL ANALYSIS

Descriptive statistics of microhardness and flexural strength were carried out.

In terms of microhardness, firstly, it was calculated the mean of the twelve measurements for each specimen. Then, values of mean, standard deviation, median and interquartile range were determined per group.

On the other hand, values of the flexural strength in terms of mean, standard deviation, median and interquartile range per group were also determined.

Since data didn't follow a normal distribution for the studied variables, verified by Kolmogorov-Smirnov and Shapiro-Wilk normality tests, the results were submitted to the non-parametric tests according to the Mann-Whitney method to determine whether there were specific significant differences among groups.

In all statistical tests, it was considered the 5% level of significance (p=0.05).

Data were statistically analysed using SPSS Statistics 20 (SPSS Inc., Chicago, IL., USA).

4. RESULTS

4.1. MICROHARDNESS

For each material, the descriptive analysis of the obtained data was performed. In terms of microhardness, the values of mean, standard deviation, median and interquartile range were determined (**Table 2**).

TABLE 2. Mean, standard deviation, median and interquartile range of the microhardness values (KHN) of each group of concentration of CHX of *Kooliner*, *Ufi Gel Hard* and *Probase Cold* (*n*=8).

MATERIAL	*CHX CONCENTRATION*	*n*	*WEEK (HOUR)*	*MICROHARDNESS (KHN)*		
				M ±SD	*MED*	*IQ*
***KOOLINER* (K)**	**0%**	8	1 (168)	7.1 ± 1.48	7.1	2.95
			2 (336)	7.5 ± 1.68	7.9	3.00
			3 (504)	7.3 ± 1.71	7.4	3.32
			4 (672)	7.0 ± 1.77	7.2	2.97
	2.5%	8	1 (168)	6.7 ± 1.54	6.6	2.42
			2 (336)	7.3 ± 1.33	7.2	2.70
			3 (504)	7.4 ± 1.15	7.3	2.07
			4 (672)	6.9 ± 1.78	7.0	3.44
***UFI GEL HARD* (UF)**	**0%**	8	1 (168)	8.0 ± 1.51	7.9	2.91
			2 (336)	7.9 ± 1.34	8.0	2.48
			3 (504)	7.7 ± 1.33	7.8	2.68
			4 (672)	7.6 ± 1.18	7.6	2.25
	5%	8	1 (168)	7.7 ± 1.02	7.8	1.84
			2 (336)	8.0 ± 0.99	7.8	2.00
			3 (504)	7.9 ± 1.05	7.8	1.86
			4 (672)	7.6 ± 0.93	7.9	1.94
***PROBASE COLD* (PC)**	**0%**	8	1 (168)	14.3 ± 2.52	14.3	4.45
			2 (336)	14.4 ± 2.37	14.1	4.20
			3 (504)	14.1 ± 2.32	13.9	4.22
			4 (672)	13.6 ± 2.27	13.1	4.17

	5%	8	1 (168)	12.8 ± 1.65	12.7	2.68
			2 (336)	12.9 ± 1.48	12.8	2.56
			3 (504)	12.4 ± 1.05	12.3	1.97
			4 (672)	12.7 ± 2.12	12.4	3.94

M = Mean; **SD** = Standard deviation; **MED** = Median; **IQ** = Interquartile range.

Concerning *Kooliner*, there are no statistically significant differences on the microhardness values with the 2.5% CHX loading in any of the time periods tested (after 1 week or 168 hours – p=0.462; after 2 weeks or 336 hours – p=0.916; after 3 weeks or 504 hours – p=0.834; after 4 weeks or 672 hours – p=0.753) (**Figure 27**).

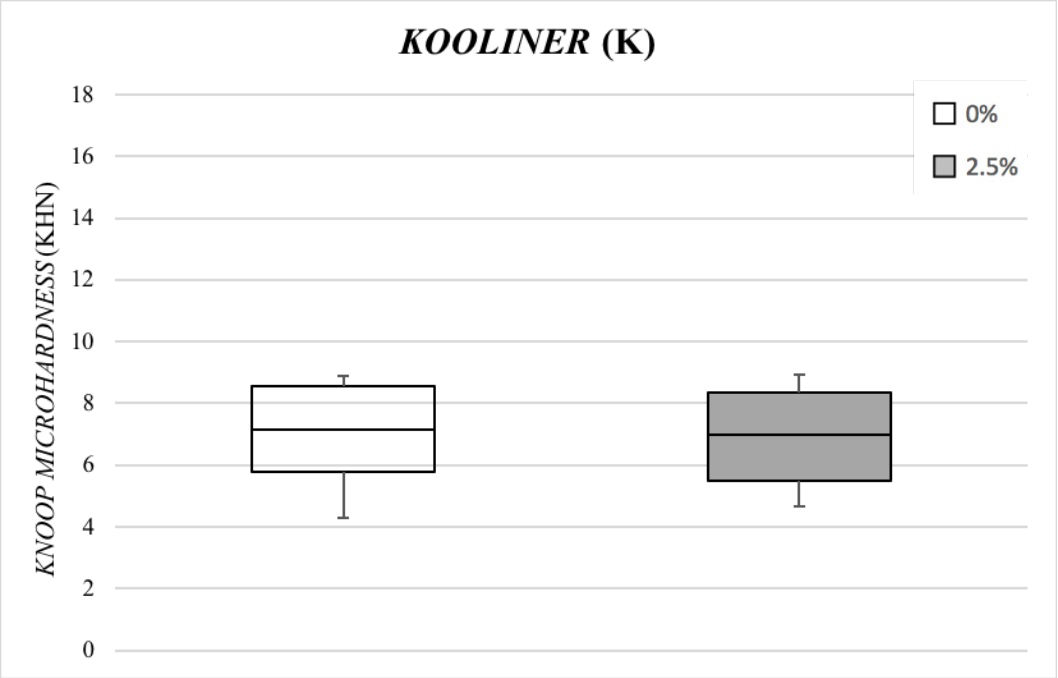


FIGURE 27. Boxplot of the microhardness (KHN) of control and 2.5% CHX in *Kooliner* after 4 weeks (672 hours).

Also, no statistically significant differences were observed on the microhardness values at any of the time intervals tested (after 1 week or 168 hours – p=0.713; after 2 weeks or 336 hours – p=0.563; after 3 weeks or 504 hours – p=0.674; after 4 weeks or 672 hours – p=0.875), between the CHX concentration of 5% incorporated in the *Ufi Gel Hard* acrylic reline resin and the control group (**Figure 28**).

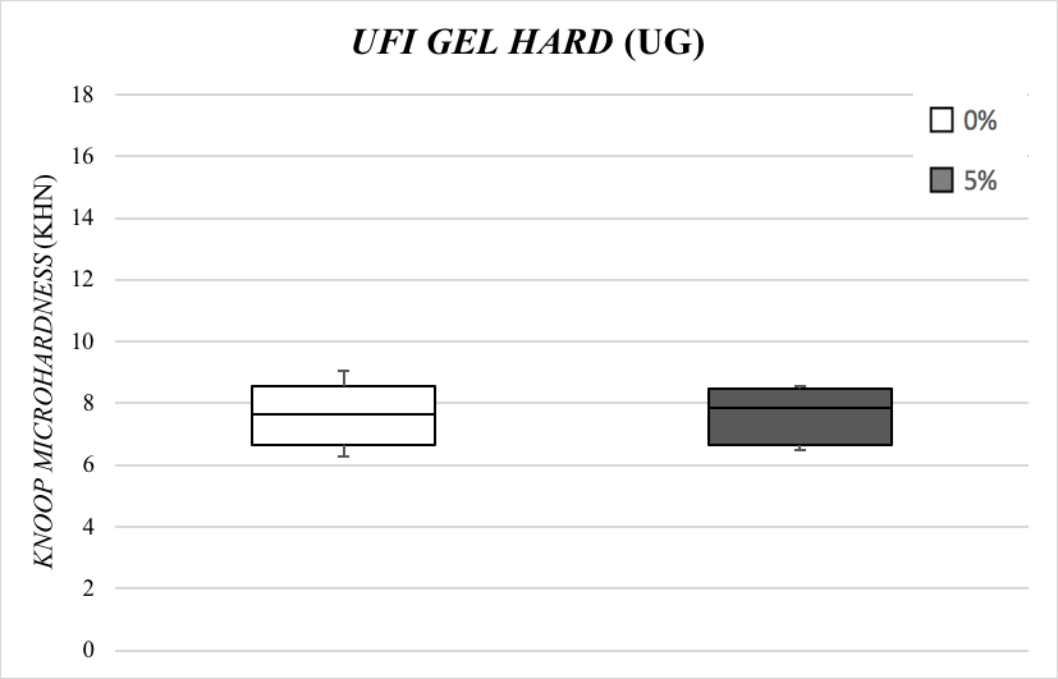


FIGURE 28. Boxplot of the microhardness (KHN) of control and 5% CHX in *Ufi Gel Hard* after 4 weeks (672 hours).

Finally, in relation to the group of specimens of the *Probase Cold*, no statistically significant differences in microhardness values with 5% CHX loading were found (after 1 week or 168 hours – p=0.093; after 2 weeks or 336 hours – p=0.093; after 3 weeks or 504 hours – p=0.208; after 4 weeks or 672 hours – p=0.172) (**Figure 29**).

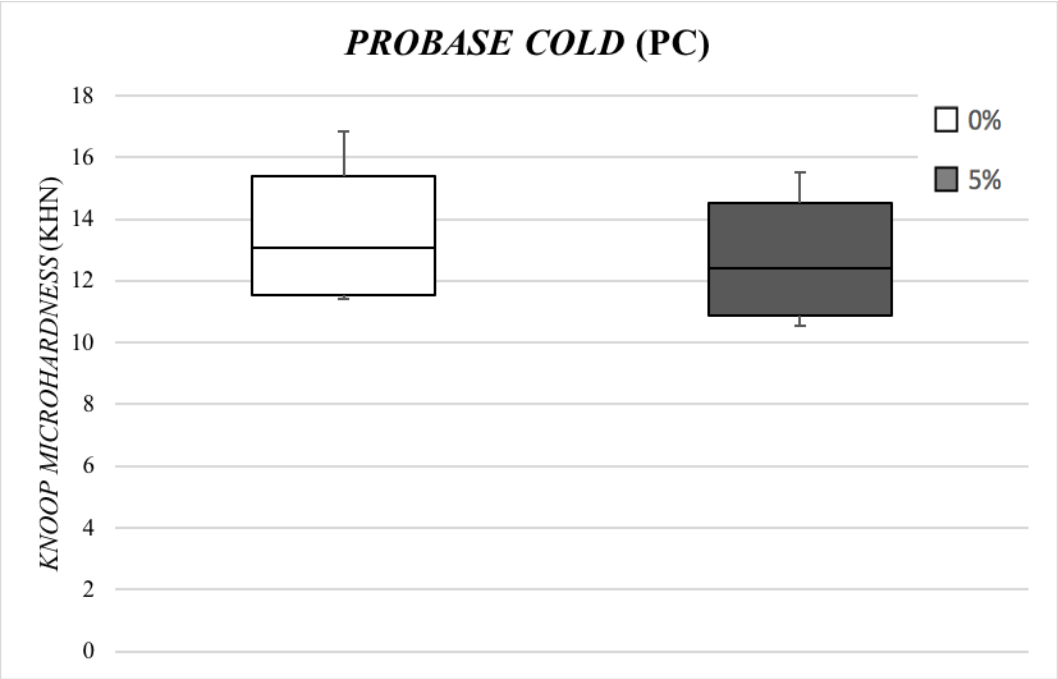


FIGURE 29. Boxplot of the microhardness (KHN) of control and 5% CHX in *Probase Cold* after 4 weeks (672 hours).

4.2. FLEXURAL STRENGTH

For each material, the descriptive analysis of the obtained data was performed. The flexural strength values of mean, standard deviation, median and interquartile range were determined (**Table 3**).

TABLE 3. Mean, standard deviation, median and interquartile range of the flexural strength values (MPa) of each group of concentration of CHX of *Kooliner*, *Ufi Gel Hard* and *Probase Cold* (*n*=8).

MATERIAL	*CHX CONCENTRATION*	*n*	*FLEXURAL STRENGTH (MPa)*		
			M ± SD	*MED*	*IQ*
***KOOLINER* (K)**	**0%**	8	42.5 ± 7.82	42.0	14.88
	2.5%	8	42.9 ± 7.51	42.1	12.89
***UFI GEL HARD* (UG)**	**0%**	8	37.5 ± 4.41	36.5	6.51
	5%	8	37.7 ± 4.89	37.4	5.60
***PROBASE COLD* (PC)**	**0%**	8	82.1 ± 12.17	87.3	19.04
	5%	8	65.8 ± 4.96	65.6	9.74

M = Mean; **SD** = Standard deviation; **MED** = Median; **IQ** = Interquartile range.

Concerning the *Kooliner* specimen group, there are no statistically significant differences on the flexural strength values between the CHX concentrations of 0% and 2.5% (p=0.916) (**Figure 30**).

In the *Ufi Gel Hard* acrylic reline resin, there are no statistically significant differences on the flexural strength values, when a concentration of CHX of 0% and 5% is incorporated (p=0.600) (**Figure 31**).

Finally, in the *Probase Cold* specimen group, after 28 days of chemical ageing, there are statistically significant differences on the flexural strength values between the CHX concentrations of 0% and 5% (p=0.021) (**Figure 32**).

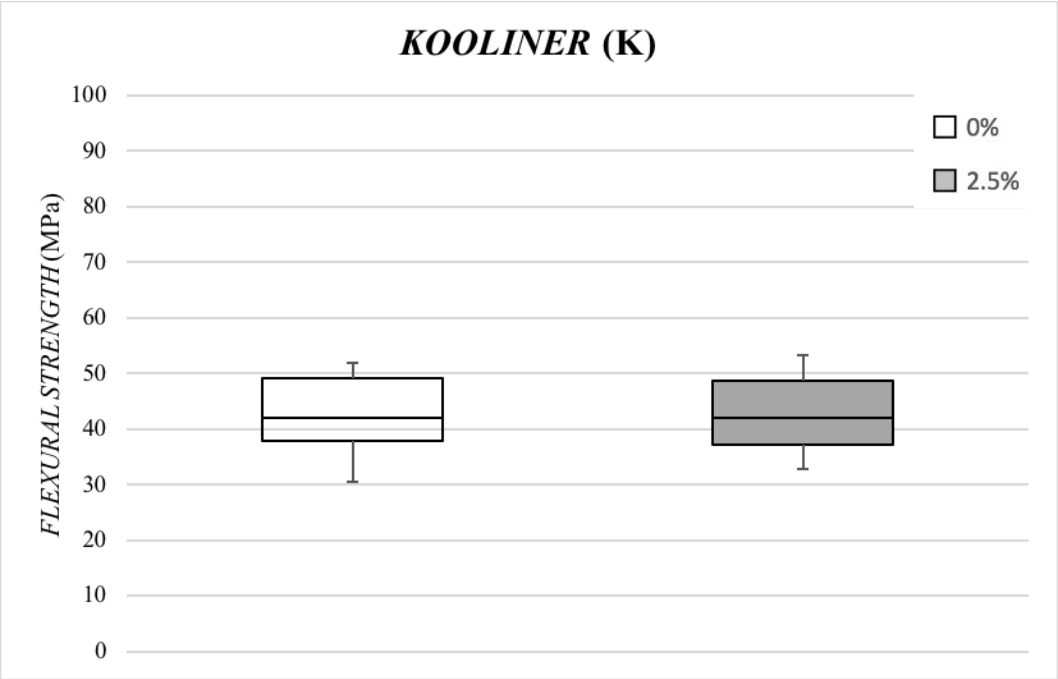


FIGURE 30. Boxplot of the flexural strength (MPa) of control and 2.5% CHX in *Kooliner* after 4 weeks (672 hours).

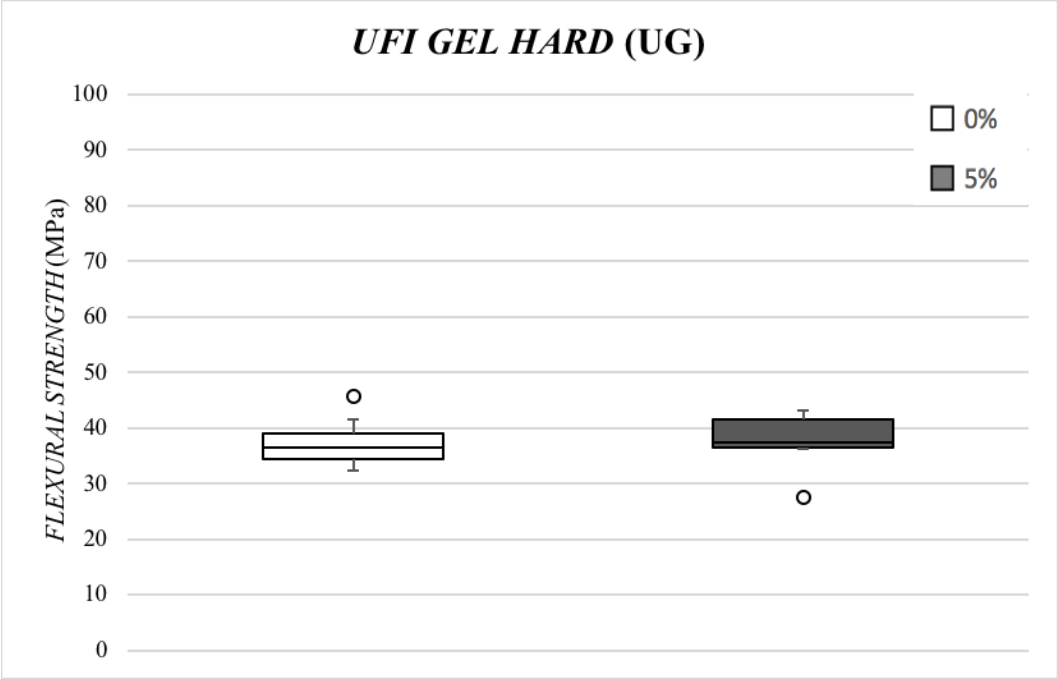


FIGURE 31. Boxplot of the flexural strength (MPa) of control and 5% CHX in *Ufi Gel Hard* after 4 weeks (672 hours).

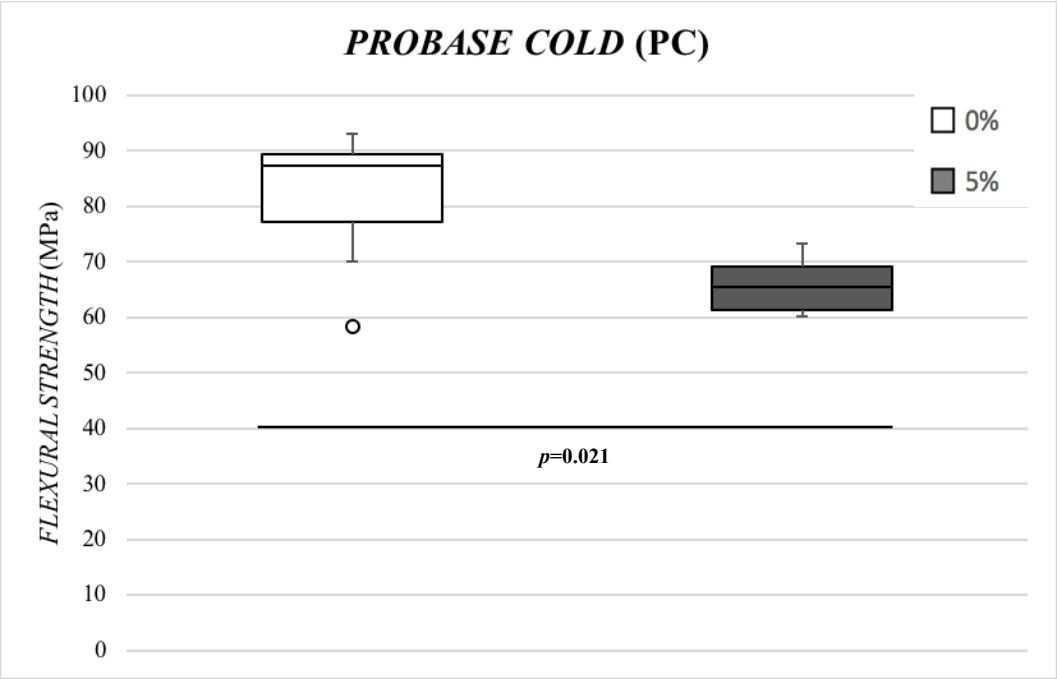


FIGURE 32. Boxplot of the flexural strength (MPa) of control and 5% CHX in *Probase Cold* after 4 weeks (672 hours).

5. DISCUSSION

In the present study, microhardness and flexural strength of three acrylic reline resins (*Kooliner*, *Ufi Gel Hard* and *Probase Cold*) incorporated with different concentrations of CHX were evaluated to test if there is a negative influence of loading the resins on the mechanical properties, after chemical ageing.

Concerning the CHX concentrations used in this study, the selection of groups was made taking into account the results obtained in previous studies. (67-68,72-73,88,90,100-102) A microbiological study demonstrated that the incorporation of CHX in acrylic reline resins seems to have an influence on the microbiological activity against *Candida albicans*. Thus, a CHX concentration of 2.5% in *Kooliner* acrylic reline resin and a CHX concentration of 5% in *Ufi Gel Hard* and *Probase Cold* acrylic reline resins may be the best option, since they present antifungal activity against *Candida albicans*. In turn, the CHX concentration of 1% was eliminated from all materials, since its antimicrobial activity against this fungus was not proved. (88) A study has shown that incorporating a CHX concentration of 10% could negatively influence the microhardness and flexural strength of *Kooliner* and *Probase Cold* acrylic reline resins. (67) Another study also found that the CHX concentration of 7.5% could decrease the mechanical properties of the *Probase Cold* acrylic reline resin. (72) Thus, it was decided to use the concentrations of 2.5% CHX in *Kooliner* and 5% CHX in *Ufi Gel Hard* and *Probase Cold*.

As mentioned, the acrylic reline resins evaluated in this study (*Kooliner*, *Ufi Gel Hard* and *Probase Cold*) were selected due to their differences in chemical composition and structural organization. (103-104) *Kooliner* and *Ufi Gel Hard* are both direct acrylic reline resins composed of poly(ethyl methacrylate) particles. However, *Kooliner* is also constituted by the monomer isobutyl methacrylate, forming a non-crosslinking net, whereas *Ufi Gel Hard* is constituted by the monomer 1,6-hexonodioldimethacrylate and forms a crosslinking net, more complex than the previous one. (103-104) *Probase Cold* is, in turn, an indirect acrylic reline resin composed by the polymer poly(methyl methacrylate) and the monomer methyl methacrylate, presenting a reduced amount of residual monomer after its polymerization. (103-104)

Several studies use distilled water or artificial saliva at pH=7 as a solution medium to investigate drug release, but only a few studies test the release in artificial saliva with different pH values. (36,86,90-93) It is important to simulate the conditions of the oral cavity, since it is exposed to endogenous and exogenous acids (94) and, in addition, in cases of denture stomatitis,

the pH of the oral cavity is lower (pH about 5.2). (49) Additionally, artificial saliva has properties that can influence results, such as viscosity. (102)

In this study, exposure to an acid pH (pH=3) was performed cyclically – 6 hours, interchanging with 18 hours at pH=7, since it was suggested that an individual with a cariogenic diet presented, daily, an average of about 6 hours in an acid environment. (95-96) According to a study conducted in 2016, it was suggested that the maximum cumulative release of CHX was higher at pH=3 and pH=7. (101) Thus, when the specimens of these acrylic reline resins are subjected to lower pH values, there is a higher drug release, which is in agreement with another study. (92,101) In addition, it is important to simulate the most deviant possible situation in terms of pH values but, at the same time, physiologically tolerable for oral tissues.

Furthermore, it is a study with a duration of 28 days, which allows comparisons with other investigations. (28,53,86) It has been shown that, once CHX is incorporated into poly(methyl methacrylate), its therapeutic dose is retained for a period of 28 days. (28,32)

An important property that allows the use of acrylic materials in dentures is its hardness. (106-107) Hardness is defined as the resistance offered by a material to permanent surface indentation or penetration. Materials with high hardness resist better to a various environmental condition of the oral cavity, as well as excessive wear caused by denture cleansers, toothbrushing or food than materials with lower hardness. (107)

In relation to the microhardness test and the use of the Knoop indenter tool for the measurements, it can be stated that the Knoop hardness number (KHN) is determined by the length of an indentation made by a rhomboid cutting tool, with a determined load on the material. The geometry of the cutting tool is significant since the measurement results from the stable cut made by the long axis of the indenting tool, due to the fact that the indentation made by the smaller axis would lead to greater relaxation and stress distribution in the material. Taking into account that the applied load can be variable and that relaxation is allowed, this test can be carried out on relatively soft materials, such as acrylic resins. (108-109) Furthermore, since the time interval between indentation and measurement is short, it is assumed that viscoelastic recovery is minimal. (73)

Evaluating the effect of CHX incorporation on the microhardness of three acrylic reline resins, there are no statistically significant differences between the test groups (2.5% CHX incorporation for *Kooliner* and 5% CHX incorporation for *Ufi Gel Hard* and *Probase Cold*) and the control groups. Thus, we cannot reject the first, second and third null hypotheses, which states that the microhardness of each acrylic reline resin is not affected by the incorporation of CHX.

A study conducted with a thermal ageing protocol presented results that are in accordance with the present study: although the group with 2.5% CHX incorporated in the acrylic reline resin *Ufi Gel Hard* showed higher values of microhardness when compared to the control group, none of the concentration of CHX in any of the materials affected negatively this mechanical property, as verified in this investigation. (73)

The flexural strength of a material is an intrinsic mechanical property that can be described as the force required to fracture an object that is subject to applied loads, between its fixed end-points. The flexural properties of a removable denture are tested when mastication or impact forces are applied. (17) It is known, therefore, that a decrease in the flexural strength at the base of the acrylic resin of the denture may result in a higher incidence of fracture due to impact or occlusal forces. (80)

Flexural strength is a widely studied property. (6,60,110-112) It was one of the properties selected since it is one of the most important when evaluating dental polymers and helps to predict the clinical performance of the denture when subjected to masticatory forces. (17,60,113)

In the present study, the influence of different CHX concentrations on the flexural strength differed among the acrylic reline resins tested. In relation to the *Kooliner* and *Ufi Gel Hard* groups, there are no statistically significant differences between specimens from the control and test groups. The fact that the groups of both materials have not been affected by the incorporation of CHX can be explained by their similar chemical constitution, since both are composed of pre-polymerized particles of poly(ethyl methacrylate). (103)

The results are similar to those obtained by previous studies, since the specimens of *Kooliner*, at the concentration of 2.5% of CHX, and *Ufi Gel Hard*, at the concentration of 5% of CHX, did not show a negative impact on flexural strength. (68,72,114)

At this time, the fourth and fifth null hypotheses cannot be rejected, since there are no statistically significant differences between specimens of the control groups (concentration of 0% of CHX) and test groups, with different concentrations of CHX incorporated.

In the acrylic reline resin *Probase Cold*, the group with a concentration of 5% of CHX incorporated exhibits significantly lower flexural strength compared to the control group. At this point, it may be concluded that the sixth null hypothesis can, however, be rejected. The results obtained in the 5% CHX group of the acrylic resin are in accordance with many other studies which have shown a reduction in flexural strength values after incorporation with antimicrobial agents. (60,67-68,72,80-81,111,115-116) Some authors have also described an inverse proportionality relationship between the concentration of antimicrobial introduced and

the values of flexural strength, which means that high amounts of drug incorporated in the acrylic resins can translate into lower values of flexural strength. (68,81,116)

Probase Cold acrylic reline resin was the only one that demonstrated significant differences between the groups. This acrylic resin has a different chemical composition, since it is composed of pre-polymerized particles of poly(methyl methacrylate). In addition, it has a different organization when compared to the other acrylic resins studied. Unlike the *Kooliner* and *Ufi Gel Hard* acrylic reline resins, the polymerization cycle of the resin is made at high temperature and pressure. (103-104)

According to an author, the physical presence of CHX particles in the acrylic resin matrix can alter the physical form of the polymers. (116) Some studies related the decrease in the flexural strength of the acrylic resin with the possible increase of the intermolecular distance between the monomers of the polymer chains after the incorporation of drugs, associated to the presence of a greater amount of residual monomer and to a lower degree of conversion of the acrylic resin. (80,111) As reported by some authors, the residual monomer adversely affects, through a plasticizer effect, the mechanical properties of the resins. (112,117)

Thus, the reduction of the flexural strength of the 5% CHX group of the *Probase Cold* acrylic resin may be related to the increase in the intermolecular distance between the monomers in the polymer chains and the increase in the amount of residual monomer.

It is also important to remember that CHX is continuously released from the acrylic resins and the size of the CHX particles included may result in various spaces of different sizes within the material, which can cause a significant decrease in flexural strength values. (72,112,117)

Furthermore, a decreased flexural strength may result in less resistance to external agents, such as masticatory forces, and a high incidence of fracture when the acrylic resin is subjected to occlusal stress. (80) Besides all the facts mentioned, the 5% CHX group exhibits a clinically accepted flexural strength by ISO (65MPa) (118), which is not the case in the groups of specimens of *Kooliner* and *Ufi Gel Hard* acrylic reline resins. A previous study demonstrated, however, that all the results obtained presented a clinically acceptable flexural strength value, according to ISO (65MPa or more), which was not observed in this study. (68,114)

With this study, it was possible to infer important conclusions, highlighting the possible CHX concentrations to be incorporated in three acrylic reline resins without influencing the microhardness and the flexural strength, after being subject to chemical ageing during a period of 28 days.

However, the results are limited. It is important not to forget that the studied acrylic resins are reline resins, that will not be used isolated in the oral cavity. In future investigations, it would be important to study the flexural strength of the tested materials after the material has been relined on an acrylic denture.

Likewise, it will be important to investigate other physical and mechanical properties of the acrylic resins after incorporation of CHX, not only after chemical ageing, but also after a combination of thermal and chemical ageing, reproducing as closely as possible the environment of the oral cavity.

6. CONCLUSIONS

Within the limitations of the present study, it was possible to conclude that:

- Loading *Kooliner* with 2.5% CHX, *Ufi Gel Hard* with 5% CHX and *Probase Cold* with 5% CHX does not affect the microhardness of the acrylic reline resins after chemical ageing;
- Loading *Kooliner* with 2.5% CHX and *Ufi Gel Hard* with 5% CHX does not show to affect the flexural strength after chemical ageing;
- Loading *Probase Cold* with 5% CHX affects the flexural strength, presenting lower values than the 0% CHX group.

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APPENDICES

APPENDIX 01 – MANUFACTURER'S INSTRUCTIONS

KOOLINER (GC America Inc., Alsip, IL., USA)

Prior to use, carefully read the instructions for use. EN

KOOLINER™

HARD CHAIRSIDE DENTURE RELINE

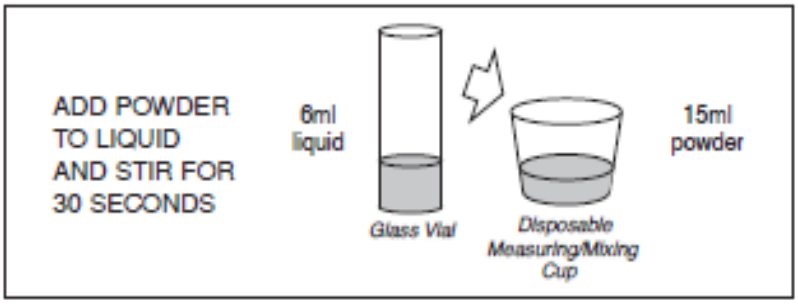
For use only by a dental professional in the recommended indications.

RECOMMENDED INDICATIONS
A temporary lining for acrylic dentures. For use in chairside procedures.

CONTRAINDICATIONS
Patients who have shown sensitivity to methacrylates. In case of allergy refer to a physician. Not intended for permanent lining.

DIRECTIONS FOR USE

1. **Preparation of the denture:**
   Relieve and roughen the area of the denture to be relined. Clean and dry the denture thoroughly. Coat labial and buccal surfaces of the denture with COE LUBRICANT. Do not apply coating within 3mm (1/8 inch) of the peripheral border. If the denture has plastic teeth also protect them with COE LUBRICANT.
2. **Preparation of KOOLINER:**
   Recommended powder / liquid ratio is 15ml powder to 6ml liquid. Pour liquid into the mixing cup and then add the powder slowly. Stir thoroughly for no more than 30 seconds and avoid the introduction of air bubbles.



3. **Application:**
   After approximately 1-2 minutes, spread the mixture of KOOLINER over the area to be relined. Seat the denture in the manner of taking an impression and instruct the patient to close lightly into occlusion. After 3 minutes, instruct the patient to move lips and cheeks so that a muscle trimmed periphery is obtained. Remove the denture and rinse under cold water. Trim away excess material. Re-seat the denture and instruct the patient to close FIRMLY into occlusion, and to hold this position for 5 minutes. Remove the denture and rinse again in cold water.
4. **Finishing:**
   Peak curing temperature: Approximately 43°C/110°F at 7 minutes when tested according to ADA/ANSI specification number 17. In thicker applications, peak temperature may exceed that stated above, possibly producing a hazardous condition in the mouth during curing. When curing is complete (10 minutes), trim away excess. For smoothing the edges, use a hot spatula.

STORAGE
Recommended for optimal performance; store at temperature of 4-25°C (39-77°F).

PACKAGES

345001 KOOLINER Professional Package
345002 KOOLINER Powder, 3 oz (80 g)
345091 KOOLINER Liquid, 55 mL

CAUTION

1. Patient should clean daily to remove food deposits and plaque. Recommend a commercially available denture cleaner and brush. Do not recommend toothpastes or hard bristle brushes as they may damage the denture liner or denture.
2. If patient notices damage to denture (e.g., chipping, delamination, distortion, etc.) or changes in tissue condition (e.g., inflammation, discomfort, allergic reaction, etc.) have patient discontinue use and return for evaluation and consultation.
3. Personal Protective Equipment (PPE) such as gloves, face masks and safety eyewear should always be worn.
4. Ensure good ventilation/exhaustion at the workplace. Keep ignition sources away.

CLEANING AND DISINFECTING RECOMMENDATION

MULTI-USE DELIVERY SYSTEMS: To avoid cross-contamination between patients the bottles and measuring devices require mid-level disinfection. Immediately after use inspect the bottles, measuring devices and label for deterioration. Discard if damaged.

DO NOT IMMERSE. Thoroughly clean bottles and measuring devices to prevent drying and accumulation of contaminants. Disinfect with a mid-level registered healthcare-grade infection control product according to regional/national guidelines.

Some products referenced in the present IFU may be classified as hazardous according to GHS. Always familiarize yourself with the Safety Data Sheets available at:
http://www.gceurope.com
or for the Americas:
http://www.gcamerica.com
They can also be obtained from your supplier.

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CE 0086

℞ Only

'GC'

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PRINTED IN THE U.S.A.

UFI GEL HARD (Voco GmbH, Cuxhaven, Germany)

voco

Ufi Gel hard

GB CE

Instructions for use

Ufi Gel hard is a cold-curing permanently hard relining material for dentures on polymethacrylate basis. It is simple and quick to use for direct as well as indirect relinings.
The **Ufi Gel hard** liquid contains no methyl-methacrylates, thus minimising the risk of allergies and irritations of the mucosa. The set additionally contains a conditioner to achieve a permanent and stable bond.

Fields of application:
- hard, permanent, total or partial relinings to restore the functions of partial and total dentures
- lengthening of denture margins

Application:

1. **Preparation of the denture**
   Check occlusion and carry out corrections, if necessary. Clean denture thoroughly with a brush and dry. Roughen all areas to be relined incl. buccal and labial margins with a suitable bur. Then clean and dry. Insulate areas not to be relined (e. g. artificial teeth, labial and buccal area below roughened surfaces), with e. g. vaseline.
   Clasps, anchors and attachments of partial dentures have to be blocked out with thin-flowing silicone or wax with low melting point.
2. **Application of the conditioner**
   Apply conditioner with enclosed brush on all surfaces to be relined and let dry in the air (approx. 30 s). First coat the labial and buccal surfaces, then the base of the denture. The conditioner remains effective for about 10 min after application.
   Attention: Close the bottle tightly immediately after use because of high volatility.
   The brush can be cleaned with e. g. alcohol.
3. **Dosing and mixing**
   Prior to first use, exchange the transportation cap against the dropper.
   Ufi Gel hard is mixed in a proportion 1 ml liquid to 3 ml (≙ 1.8 g) powder. This corresponds to 2 graduation marks of the dropper to 1 graduation mark of the glass cylinder.

2 graduation marks liquid : 1 graduation mark powder

A thicker consistency, e. g. for lengthening the margins of the denture, is achieved by taking more powder.
Take out *liquid* with the dropper and put it into a PP-mixing cup. Shake the *powder* shortly and dispense it into the glass cylinder. For exact dosing make a smooth surface of the powder by slightly tapping on the side of the glass cylinder. Put powder into the liquid and mix carefully homogeneously with plastic spatula. Bubbles should be avoided by stirring slowly and along the side of the mixing cup. Let any bubbles rise to the top by tapping the mixing cup. Let the material soak until a workable consistency is achieved (approx. 1.5 min after the begin of mixing).

4. Application of Ufi Gel hard
Apply the material with a plastic spatula evenly onto the prepared margin and/or base of the denture, avoid excess and remove with a suitable instrument respectively.
Re-insert denture and have the patient exert slight occlusional pressure for 1 min. Then carry out functional, chewing and swallowing movements for 2 min. Make sure that no material flows into the throat when relining an upper denture, especially at the transition from hard to soft palate (A-line).

4.1 Partial and total denture with undercuts
Remove denture after 5 min after the begin of mixing and remove excess immediately with scissors or a scalpel. Insert again into the mouth for a final occlusion check and let cure for about 2 - 3 min.
Instead of re-inserting the denture, curing can also be completed in warm water, i.e. in a pressure pot at approx. 40°C. **Do not let material cure under contact to air** since oxygen will cause an uncured inhibition layer on the surface.

4.2 Total dentures without undercuts
Excess material can be removed intra- or extraorally before final polymerization.
Intraorally: remove excess material after 5 min (beginning of mixing) with a suitable instrument. Let the denture cure for further 2 - 3 min in the mouth until **Ufi Gel hard** is completely cured.
Extraorally: see position 4.1

5. Finishing the relining
The relined denture can be finished and polished with the usual instruments (tungsten carbide bur, silicone polisher, polishing disc).

beginning of mixing	2 min	mix and apply
insert denture into the mouth	1 min	exert pressure
	2 min	functional movements
remove denture if necessary	1.5 min	remove excess
insert denture into the mouth	2 min	curing
remove denture	1 min	finishing, polishing
	9.5 min	

☐ extraorally ☐ intraorally ☐ intra- or extraorally

Indications, precautionary measures:

- Store bottles of liquid and conditioner carefully closed and in upright position
- Avoid contact of liquid or conditioner to skin. Rinse contacted parts of the skin thoroughly with water and soap
- In case of contact with the eyes rinse thoroughly with water and consult an ophtalmologist
- **Ufi Gel hard** contains hydroxyethylmethacrylate, benzoyl-peroxid, acetone, do not use in case of allergies against these ingredients
- The stated time periods refer to a room temperature of 25°C as well as temperature in the mouth of 35°C. Polymerization will be slower at lower temperatures, higher temperatures will accelerate polymerization
- Too long or violent mixing might lead to air bubbles and unhomogeneous consistency which produces a rough surface
- Use the mixing cup several times
- Store at temperatures 4°C - 23°C

Cleaning indications:

Dentures relined with **Ufi Gel hard** can be cleaned with the usual cleansers and procedures. This refers to domestic as well as to professional cleaning.

Our preparations have been developed for use in dentistry. As far as the application of the products delivered by us is concerned, our verbal and/or written information has been given to the best of our knowledge and without obligation. Our information and/or advice do not relieve you from examining the materials delivered by us as to their suitability for the intended purposes of application. As the application of our preparations is beyond our control, the user is fully responsible for the application. Of course, we guarantee the quality of our preparations in accordance with the existing standards and corresponding to the conditions as stipulated in our general terms of sale and delivery.

PROBASE COLD (Ivoclar Vivadent AG, Liechtenstein)

ProBase® Cold

Instructions for Use
Verarbeitungsanleitung
Mode d'emploi
Istruzioni d'uso
Instrucciones de uso
Instruções de Uso
Bruksanvisning
Brugsanvisning
Käyttöohjeet
Bruksanvisning
Productinformatie
Οδηγίες Χρήσεως
Kullanma Talimatı
Инструкция по применению
Instrukcja stosowania

BPS

CE 0123

Complies with / entspricht:
ISO 20795-1; EN ISO 20795-1

For dental use only.
Rx only

Manufacturer:
Ivoclar Vivadent AG, FL-9494 Schaan/Liechtenstein
www.ivoclarvivadent.com

ivoclar vivadent: technical

english

Description
ProBase® Cold is a self-curing denture base material. It demonstrates excellent flow and modelling properties. It is easy and reliable to use with the pouring or packing technique, even when two or more saddles are present. The material is available in a variety of shades. As the powder and liquid can be dosed as desired within the usual limits, users can vary the consistency and working time of ProBase Cold.

Composition
Powder
Polymethyl methacrylate, softening agent, benzoyl peroxide, catalyst, pigments

Liquid
Methyl methacrylate, dimethacrylate, catalyst

Indication
- Partial dentures
- Combination dentures
- Relining
- Repairs
- Complete dentures

Contraindication
- Direct intraoral contact of unpolymerized material.
- If the patient is known to be allergic to any of the ingredients in ProBase Cold

Side effects
In individual cases, local allergic reactions to polymethyl methacrylate materials have been reported.

Application

Pouring technique
Preparation
Isolate boiled-out, well-wetted plaster surfaces with two layers of Ivoclar Vivadent Separating Fluid. Allow to dry, well roughen the teeth, apply mechanical retention, and wet with monomer to ensure an adequate bond with the denture base.

Dosage
- **Ideal mixing ratio**
  15 g polymer (powder) : 10 ml monomer (liquid)

Mixing
Thoroughly mix polymer and monomer with the spatula. Subsequently, allow the mixture to rest for 15 seconds to permit any trapped air to rise.
Flow phase
At room temperature (23 °C / 73 °F), the flow phase is approx. 2.5 to 3 minutes. Pour the material into the saddle within this time span.

Modelling phase
The material is set after a transition period of approx. 4 minutes. It can be modelled during an additional 3 minutes.
High room temperatures shorten the flow and modelling phase.

Polymerization
Polymerization is carried out in a pressure device (e.g. Ivomat) at 40 °C / 104 °F and at 2 to 6 bar pressure for 15 minutes.

Finishing
Remove the precast, finish and polish in the usual manner.

Packing technique
Preparation
Isolate boiled-out, well-wetted plaster surfaces with two layers of Separating Fluid and allow to dry completely. Well roughen the teeth and wet with monomer to ensure an adequate bond with the denture base.

Dosage
Ideal mixing ratio for one denture: 20.5 g polymer (= 1st graduation on measuring cylinder): 10 ml monomer

Integrated dosage system
This system ensures an ideal mixing ratio and, therefore, minimum polymerization shrinkage of ProBase Cold. The measuring cylinder for the polymer indicates the quantity of material required for one or two medium-sized dentures. The graduation on the measuring cylinder for the monomer is in millilitres.

Mixing
Thoroughly mix polymer and monomer in the given mixing ratio with a spatula. Mix thoroughly. Allow the dough to mature in a closed mixing cup for approx. 3 to 4 minutes. Subsequently, work the dough within approx. 2 minutes.
High room temperatures shorten the working time.

Pressing
Place a sufficient quantity of the resin dough in the hand-warm, wetted and isolated flask halves. Carefully close flask and load with 80 bar pressure. Fix with a clamp.

Polymerization
Polymerization is carried out by means of the clamp or a pressing device under constant pressure for 30 minutes (if the room temperture is 23 °C / 73 °F).
Deflasking and finishing
Open the flask and remove plaster. Check occlusion of the denture. Subsequently, finish and polish in the usual manner.

Repair and correction possibilities with ProBase Cold

- Corrections and repairs of ProBase Hot, ProBase Cold and SR Ivocap® may be carried out with ProBase Cold by using the pouring technique. Thoroughly roughen the corresponding surfaces and wet with monomer.
- The residual monomer content after polymerizing the material according to the method described is < 4,5%.

Warnings

- The monomer contains methyl methacrylate (MMA).
- Methyl methacrylate is easily flammable and irritating (flash point +10 °C / 50 °F).
- Irritating to eyes, skin, and respiratory system.
- May cause sensitization by skin contact.
- Avoid contact of the skin with monomer or uncured material. Commercial medical gloves do not provide protection against the sensitizing effect of methacrylates.
- Do not breathe vapour.
- Keep away from sources of ignition – no smoking.
- Do not empty into drains.
- Take precautionary measures against static discharges.

Storage

- Store material in a cool, dark, well-ventilated place. Storage temperature: 2–28 °C (36–82 °F).
- Do not use the materials after the indicated date of expiration.
- Keep out of the reach of children.

Date information prepared: 08/2012

APPENDIX 02 – EXPERIMENTAL DATA | MICROHARDNESS

KNOOP HARDNESS

KOOLINER (GC America Inc., Alsip, IL., USA)

INDENTATION	KHN
K0 W01 01.1	6.41
K0 W01 01.2	7.53
K0 W01 01.3	8.20
K0 W01 01.4	9.93
K0 W01 01.5	8.14
K0 W01 01.6	7.82
K0 W01 01.7	8.99
K0 W01 01.8	9.96
K0 W01 01.9	6.31
K0 W01 01.10	7.81
K0 W01 01.11	6.11
K0 W01 01.12	11.60
K0 W01 02.1	7.69
K0 W01 02.2	7.56
K0 W01 02.3	7.06
K0 W01 02.4	6.54
K0 W01 02.5	7.49
K0 W01 02.6	8.89
K0 W01 02.7	8.06
K0 W01 02.8	10.70
K0 W01 02.9	11.60
K0 W01 02.10	7.00
K0 W01 02.11	7.02
K0 W01 02.12	6.66
K0 W01 03.1	6.16
K0 W01 03.2	11.80

INDENTATION	KHN
K0 W01 03.3	8.27
K0 W01 03.4	9.46
K0 W01 03.5	13.40
K0 W01 03.6	6.55
K0 W01 03.7	7.48
K0 W01 03.8	4.72
K0 W01 03.9	9.95
K0 W01 03.10	6.94
K0 W01 03.11	9.07
K0 W01 03.12	11.50
K0 W01 04.1	7.47
K0 W01 04.2	6.08
K0 W01 04.3	8.72
K0 W01 04.4	5.62
K0 W01 04.5	7.67
K0 W01 04.6	6.34
K0 W01 04.7	13.50
K0 W01 04.8	13.90
K0 W01 04.9	7.60
K0 W01 04.10	8.72
K0 W01 04.11	8.24
K0 W01 04.12	9.02
K0 W01 05.1	5.90
K0 W01 05.2	6.80
K0 W01 05.3	4.10
K0 W01 05.4	4.70

INDENTATION	KHN
K0 W01 05.5	4.40
K0 W01 05.6	7.00
K0 W01 05.7	7.40
K0 W01 05.8	7.00
K0 W01 05.9	6.80
K0 W01 05.10	6.30
K0 W01 05.11	7.00
K0 W01 05.12	4.50
K0 W01 06.1	7.90
K0 W01 06.2	5.30
K0 W01 06.3	7.00
K0 W01 06.4	4.30
K0 W01 06.5	5.90
K0 W01 06.6	3.80
K0 W01 06.7	4.20
K0 W01 06.8	4.60
K0 W01 06.9	7.30
K0 W01 06.10	5.20
K0 W01 06.11	4.50
K0 W01 06.12	3.90
K0 W01 07.1	6.30
K0 W01 07.2	6.30
K0 W01 07.3	5.50
K0 W01 07.4	6.50
K0 W01 07.5	6.30
K0 W01 07.6	6.10

K0 W01 07.7	6.60
K0 W01 07.8	5.40
K0 W01 07.9	4.90
K0 W01 07.10	7.20
K0 W01 07.11	6.70
K0 W01 07.12	7.00
K0 W01 08.1	7.40
K0 W01 08.2	5.80
K0 W01 08.3	4.70
K0 W01 08.4	4.80
K0 W01 08.5	5.30
K0 W01 08.6	4.60
K0 W01 08.7	5.90
K0 W01 08.8	5.90
K0 W01 08.9	5.40
K0 W01 08.10	4.50
K0 W01 08.11	4.80
K0 W01 08.12	5.90
K0 W02 01.1	9.97
K0 W02 01.2	8.29
K0 W02 01.3	10.00
K0 W02 01.4	8.23
K0 W02 01.5	6.93
K0 W02 01.6	10.40
K0 W02 01.7	10.90
K0 W02 01.8	7.68
K0 W02 01.9	9.56
K0 W02 01.10	9.27
K0 W02 01.11	7.71
K0 W02 01.12	7.83
K0 W02 02.1	8.32
K0 W02 02.2	10.80

K0 W02 02.3	7.42
K0 W02 02.4	8.54
K0 W02 02.5	10.00
K0 W02 02.6	12.10
K0 W02 02.7	9.67
K0 W02 02.8	8.34
K0 W02 02.9	9.16
K0 W02 02.10	7.51
K0 W02 02.11	8.94
K0 W02 02.12	7.55
K0 W02 03.1	8.75
K0 W02 03.2	6.30
K0 W02 03.3	10.0
K0 W02 03.4	9.19
K0 W02 03.5	7.12
K0 W02 03.6	7.16
K0 W02 03.7	11.00
K0 W02 03.8	8.10
K0 W02 03.9	13.60
K0 W02 03.10	7.35
K0 W02 03.11	9.11
K0 W02 03.12	10.20
K0 W02 04.1	8.17
K0 W02 04.2	7.70
K0 W02 04.3	7.28
K0 W02 04.4	11.40
K0 W02 04.5	8.68
K0 W02 04.6	6.27
K0 W02 04.7	11.60
K0 W02 04.8	8.73
K0 W02 04.9	9.96
K0 W02 04.10	9.84

K0 W02 04.11	9.49
K0 W02 04.12	8.38
K0 W02 05.1	6.10
K0 W02 05.2	5.00
K0 W02 05.3	5.40
K0 W02 05.4	4.40
K0 W02 05.5	9.70
K0 W02 05.6	7.70
K0 W02 05.7	5.40
K0 W02 05.8	6.60
K0 W02 05.9	5.40
K0 W02 05.10	3.80
K0 W02 05.11	4.40
K0 W02 05.12	6.10
K0 W02 06.1	5.30
K0 W02 06.2	5.00
K0 W02 06.3	5.20
K0 W02 06.4	4.50
K0 W02 06.5	4.20
K0 W02 06.6	3.60
K0 W02 06.7	7.20
K0 W02 06.8	4.80
K0 W02 06.9	4.40
K0 W02 06.10	3.60
K0 W02 06.11	4.40
K0 W02 06.12	6.30
K0 W02 07.1	8.80
K0 W02 07.2	6.80
K0 W02 07.3	7.30
K0 W02 07.4	6.10
K0 W02 07.5	7.80
K0 W02 07.6	8.10

K0 W02 07.7	5.90
K0 W02 07.8	5.50
K0 W02 07.9	6.30
K0 W02 07.10	6.60
K0 W02 07.11	6.50
K0 W02 07.12	6.50
K0 W02 08.1	4.90
K0 W02 08.2	5.00
K0 W02 08.3	6.10
K0 W02 08.4	6.20
K0 W02 08.5	6.70
K0 W02 08.6	6.80
K0 W02 08.7	8.00
K0 W02 08.8	6.30
K0 W02 08.9	6.90
K0 W02 08.10	6.40
K0 W02 08.11	7.00
K0 W02 08.12	7.00
K0 W03 01.1	5.03
K0 W03 01.2	7.72
K0 W03 01.3	7.29
K0 W03 01.4	8.74
K0 W03 01.5	6.88
K0 W03 01.6	8.74
K0 W03 01.7	8.30
K0 W03 01.8	8.56
K0 W03 01.9	8.35
K0 W03 01.10	10.00
K0 W03 01.11	10.00
K0 W03 01.12	9.81
K0 W03 02.1	7.16

K0 W03 02.2	8.20
K0 W03 02.3	8.92
K0 W03 02.4	9.34
K0 W03 02.5	11.00
K0 W03 02.6	6.26
K0 W03 02.7	10.30
K0 W03 02.8	8.44
K0 W03 02.9	9.21
K0 W03 02.10	9.35
K0 W03 02.11	8.48
K0 W03 02.12	8.60
K0 W03 03.1	10.20
K0 W03 03.2	9.30
K0 W03 03.3	7.12
K0 W03 03.4	9.06
K0 W03 03.5	9.49
K0 W03 03.6	10.30
K0 W03 03.7	8.24
K0 W03 03.8	8.37
K0 W03 03.9	9.75
K0 W03 03.10	5.01
K0 W03 03.11	9.03
K0 W03 03.12	10.90
K0 W03 04.1	9.89
K0 W03 04.2	10.20
K0 W03 04.3	10.90
K0 W03 04.4	9.03
K0 W03 04.5	9.85
K0 W03 04.6	8.90
K0 W03 04.7	6.80
K0 W03 04.8	9.79

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K0 W03 04.10	9.26
K0 W03 04.11	10.20
K0 W03 04.12	9.51
K0 W03 05.1	7.20
K0 W03 05.2	4.30
K0 W03 05.3	4.70
K0 W03 05.4	5.30
K0 W03 05.5	6.30
K0 W03 05.6	6.80
K0 W03 05.7	5.90
K0 W03 05.8	4.20
K0 W03 05.9	3.70
K0 W03 05.10	6.20
K0 W03 05.11	6.10
K0 W03 05.12	4.70
K0 W03 06.1	7.00
K0 W03 06.2	4.70
K0 W03 06.3	4.80
K0 W03 06.4	5.60
K0 W03 06.5	6.50
K0 W03 06.6	4.10
K0 W03 06.7	4.70
K0 W03 06.8	6.20
K0 W03 06.9	5.40
K0 W03 06.10	6.30
K0 W03 06.11	3.70
K0 W03 06.12	4.30
K0 W03 07.1	6.50
K0 W03 07.2	8.50
K0 W03 07.3	5.50

K0 W03 07.4	6.20
K0 W03 07.5	6.10
K0 W03 07.6	7.00
K0 W03 07.7	7.00
K0 W03 07.8	5.00
K0 W03 07.9	4.20
K0 W03 07.10	6.90
K0 W03 07.11	7.40
K0 W03 07.12	8.20
K0 W03 08.1	6.40
K0 W03 08.2	5.50
K0 W03 08.3	5.30
K0 W03 08.4	4.00
K0 W03 08.5	4.80
K0 W03 08.6	8.50
K0 W03 08.7	4.50
K0 W03 08.8	7.00
K0 W03 08.9	7.60
K0 W03 08.10	4.90
K0 W03 08.11	5.80
K0 W03 08.12	6.00
K0 W04 01.1	8.03
K0 W04 01.2	9.49
K0 W04 01.3	7.97
K0 W04 01.4	9.16
K0 W04 01.5	8.24
K0 W04 01.6	8.68
K0 W04 01.7	8.62
K0 W04 01.8	8.72
K0 W04 01.9	8.64
K0 W04 01.10	7.74

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K0 W04 01.12	8.78
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K0 W04 02.3	9.00
K0 W04 02.4	7.71
K0 W04 02.5	9.52
K0 W04 02.6	7.14
K0 W04 02.7	9.21
K0 W04 02.8	7.93
K0 W04 02.9	8.99
K0 W04 02.10	9.79
K0 W04 02.11	9.17
K0 W04 02.12	10.50
K0 W04 03.1	9.42
K0 W04 03.2	10.00
K0 W04 03.3	8.29
K0 W04 03.4	8.85
K0 W04 03.5	6.85
K0 W04 03.6	8.44
K0 W04 03.7	9.82
K0 W04 03.8	7.71
K0 W04 03.9	8.55
K0 W04 03.10	9.76
K0 W04 03.11	10.10
K0 W04 03.12	8.65
K0 W04 04.1	8.38
K0 W04 04.2	8.45
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K0 W04 04.4	7.73
K0 W04 04.5	9.93

K0 W04 04.6	8.86
K0 W04 04.7	8.27
K0 W04 04.8	7.61
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K0 W04 04.10	9.41
K0 W04 04.11	7.32
K0 W04 04.12	8.35
K0 W04 05.1	5.50
K0 W04 05.2	4.90
K0 W04 05.3	5.30
K0 W04 05.4	6.30
K0 W04 05.5	5.20
K0 W04 05.6	6.60
K0 W04 05.7	4.50
K0 W04 05.8	6.70
K0 W04 05.9	3.70
K0 W04 05.10	7.20
K0 W04 05.11	5.50
K0 W04 05.12	5.30
K0 W04 06.1	4.00
K0 W04 06.2	3.60
K0 W04 06.3	3.80
K0 W04 06.4	3.80
K0 W04 06.5	6.10
K0 W04 06.6	4.00
K0 W04 06.7	4.10
K0 W04 06.8	4.50
K0 W04 06.9	4.10
K0 W04 06.10	4.50
K0 W04 06.11	3.40
K0 W04 06.12	5.30

K0 W04 07.1	6.00
K0 W04 07.2	4.70
K0 W04 07.3	6.30
K0 W04 07.4	6.10
K0 W04 07.5	5.80
K0 W04 07.6	5.30
K0 W04 07.7	6.20
K0 W04 07.8	6.20
K0 W04 07.9	5.80
K0 W04 07.10	6.20
K0 W04 07.11	6.20
K0 W04 07.12	7.30
K0 W04 08.1	4.70
K0 W04 08.2	6.20
K0 W04 08.3	6.00
K0 W04 08.4	6.70
K0 W04 08.5	4.70
K0 W04 08.6	5.40
K0 W04 08.7	5.70
K0 W04 08.8	7.60
K0 W04 08.9	4.80
K0 W04 08.10	7.50
K0 W04 08.11	5.50
K0 W04 08.12	5.10
K2.5 W01 01.1	7.72
K2.5 W01 01.2	7.38
K2.5 W01 01.3	7.78
K2.5 W01 01.4	8.15
K2.5 W01 01.5	7.56
K2.5 W01 01.6	12.30
K2.5 W01 01.7	6.16
K2.5 W01 01.8	8.37
K2.5 W01 01.9	7.24
K2.5 W01 01.10	6.83
K2.5 W01 01.11	7.62
K2.5 W01 01.12	8.13
K2.5 W01 02.1	7.60
K2.5 W01 02.2	7.21
K2.5 W01 02.3	8.06
K2.5 W01 02.4	7.53
K2.5 W01 02.5	6.36
K2.5 W01 02.6	7.14
K2.5 W01 02.7	8.93
K2.5 W01 02.8	9.58
K2.5 W01 02.9	5.82
K2.5 W01 02.10	6.14
K2.5 W01 02.11	7.15
K2.5 W01 02.12	6.06
K2.5 W01 03.1	7.44
K2.5 W01 03.2	8.17
K2.5 W01 03.3	7.26
K2.5 W01 03.4	5.96
K2.5 W01 03.5	8.48
K2.5 W01 03.6	6.42
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K2.5 W01 03.8	6.76
K2.5 W01 03.9	6.16
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K2.5 W01 03.11	7.56
K2.5 W01 03.12	7.66
K2.5 W01 04.1	6.80
K2.5 W01 04.2	8.94
K2.5 W01 04.3	8.65
K2.5 W01 04.4	8.49
K2.5 W01 04.5	8.20
K2.5 W01 04.6	12.10
K2.5 W01 04.7	9.57
K2.5 W01 04.8	7.57
K2.5 W01 04.9	11.10
K2.5 W01 04.10	7.84
K2.5 W01 04.11	11.10
K2.5 W01 04.12	13.10
K2.5 W01 05.1	4.70
K2.5 W01 05.2	4.50
K2.5 W01 05.3	4.40
K2.5 W01 05.4	4.90
K2.5 W01 05.5	5.10
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K2.5 W01 05.7	6.80
K2.5 W01 05.8	7.40
K2.5 W01 05.9	5.00
K2.5 W01 05.10	4.70
K2.5 W01 05.11	7.70
K2.5 W01 05.12	3.80
K2.5 W01 06.1	4.10
K2.5 W01 06.2	6.50
K2.5 W01 06.3	3.90
K2.5 W01 06.4	4.90
K2.5 W01 06.5	5.30
K2.5 W01 06.6	5.10
K2.5 W01 06.7	6.50
K2.5 W01 06.8	5.60
K2.5 W01 06.9	5.10

K2.5 W01 06.10	5.50
K2.5 W01 06.11	5.50
K2.5 W01 06.12	6.60
K2.5 W01 07.1	5.30
K2.5 W01 07.2	7.00
K2.5 W01 07.3	4.80
K2.5 W01 07.4	5.40
K2.5 W01 07.5	6.10
K2.5 W01 07.6	6.60
K2.5 W01 07.7	6.70
K2.5 W01 07.8	6.40
K2.5 W01 07.9	6.30
K2.5 W01 07.10	4.30
K2.5 W01 07.11	6.70
K2.5 W01 07.12	5.30
K2.5 W01 08.1	7.00
K2.5 W01 08.2	4.80
K2.5 W01 08.3	4.60
K2.5 W01 08.4	3.70
K2.5 W01 08.5	4.30
K2.5 W01 08.6	5.70
K2.5 W01 08.7	4.80
K2.5 W01 08.8	5.40
K2.5 W01 08.9	3.70
K2.5 W01 08.10	5.50
K2.5 W01 08.11	5.00
K2.5 W01 08.12	6.10
K2.5 W02 01.1	7.20
K2.5 W02 01.2	9.70
K2.5 W02 01.3	9.01
K2.5 W02 01.4	7.79
K2.5 W02 01.5	5.57
K2.5 W02 01.6	6.92
K2.5 W02 01.7	9.07
K2.5 W02 01.8	12.40
K2.5 W02 01.9	5.87
K2.5 W02 01.10	9.03
K2.5 W02 01.11	9.03
K2.5 W02 01.12	5.36
K2.5 W02 02.1	9.52
K2.5 W02 02.2	12.60
K2.5 W02 02.3	7.64
K2.5 W02 02.4	9.20
K2.5 W02 02.5	7.30
K2.5 W02 02.6	10.40
K2.5 W02 02.7	7.88
K2.5 W02 02.8	8.45
K2.5 W02 02.9	8.18
K2.5 W02 02.10	9.92
K2.5 W02 02.11	8.09
K2.5 W02 02.12	8.97
K2.5 W02 03.1	11.10
K2.5 W02 03.2	5.92
K2.5 W02 03.3	7.16
K2.5 W02 03.4	6.49
K2.5 W02 03.5	10.00
K2.5 W02 03.6	7.25
K2.5 W02 03.7	8.32
K2.5 W02 03.8	7.93
K2.5 W02 03.9	8.51
K2.5 W02 03.10	6.01
K2.5 W02 03.11	9.39
K2.5 W02 03.12	7.85
K2.5 W02 04.1	9.63
K2.5 W02 04.2	9.74
K2.5 W02 04.3	9.24
K2.5 W02 04.4	12.10
K2.5 W02 04.5	9.55
K2.5 W02 04.6	8.13
K2.5 W02 04.7	7.23
K2.5 W02 04.8	9.36
K2.5 W02 04.9	6.79
K2.5 W02 04.10	10.20
K2.5 W02 04.11	8.58
K2.5 W02 04.12	8.01
K2.5 W02 05.1	4.70
K2.5 W02 05.2	4.80
K2.5 W02 05.3	6.70
K2.5 W02 05.4	8.10
K2.5 W02 05.5	6.90
K2.5 W02 05.6	7.80
K2.5 W02 05.7	6.30
K2.5 W02 05.8	5.50
K2.5 W02 05.9	4.10
K2.5 W02 05.10	4.70
K2.5 W02 05.11	5.50
K2.5 W02 05.12	7.30
K2.5 W02 06.1	5.10
K2.5 W02 06.2	6.30
K2.5 W02 06.3	6.50
K2.5 W02 06.4	5.20
K2.5 W02 06.5	6.20
K2.5 W02 06.6	6.30

K2.5 W02 06.7	5.70
K2.5 W02 06.8	5.20
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K2.5 W02 06.10	5.30
K2.5 W02 06.11	6.70
K2.5 W02 06.12	7.40
K2.5 W02 07.1	6.80
K2.5 W02 07.2	5.50
K2.5 W02 07.3	5.80
K2.5 W02 07.4	5.60
K2.5 W02 07.5	6.30
K2.5 W02 07.6	5.50
K2.5 W02 07.7	7.40
K2.5 W02 07.8	6.00
K2.5 W02 07.9	6.60
K2.5 W02 07.10	6.30
K2.5 W02 07.11	7.40
K2.5 W02 07.12	7.70
K2.5 W02 08.1	6.30
K2.5 W02 08.2	6.60
K2.5 W02 08.3	3.70
K2.5 W02 08.4	4.80
K2.5 W02 08.5	4.90
K2.5 W02 08.6	8.50
K2.5 W02 08.7	7.60
K2.5 W02 08.8	6.10
K2.5 W02 08.9	5.10
K2.5 W02 08.10	5.70
K2.5 W02 08.11	6.60
K2.5 W02 08.12	8.90
K2.5 W03 01.1	6.57
K2.5 W03 01.2	8.14
K2.5 W03 01.3	8.62
K2.5 W03 01.4	7.49
K2.5 W03 01.5	9.04
K2.5 W03 01.6	7.72
K2.5 W03 01.7	8.91
K2.5 W03 01.8	9.53
K2.5 W03 01.9	9.25
K2.5 W03 01.10	9.25
K2.5 W03 01.11	8.98
K2.5 W03 01.12	7.19
K2.5 W03 02.1	6.81
K2.5 W03 02.2	7.75
K2.5 W03 02.3	9.78
K2.5 W03 02.4	8.67
K2.5 W03 02.5	10.10
K2.5 W03 02.6	8.16
K2.5 W03 02.7	6.99
K2.5 W03 02.8	7.60
K2.5 W03 02.9	8.14
K2.5 W03 02.10	7.53
K2.5 W03 02.11	5.48
K2.5 W03 02.12	9.37
K2.5 W03 03.1	6.82
K2.5 W03 03.2	9.12
K2.5 W03 03.3	7.59
K2.5 W03 03.4	9.89
K2.5 W03 03.5	9.13
K2.5 W03 03.6	7.93
K2.5 W03 03.7	10.10
K2.5 W03 03.8	6.78
K2.5 W03 03.9	12.20
K2.5 W03 03.10	10.10
K2.5 W03 03.11	9.05
K2.5 W03 03.12	8.30
K2.5 W03 04.1	9.79
K2.5 W03 04.2	8.71
K2.5 W03 04.3	12.20
K2.5 W03 04.4	6.65
K2.5 W03 04.5	11.50
K2.5 W03 04.6	7.90
K2.5 W03 04.7	10.50
K2.5 W03 04.8	6.96
K2.5 W03 04.9	5.85
K2.5 W03 04.10	6.52
K2.5 W03 04.11	6.83
K2.5 W03 04.12	8.81
K2.5 W03 05.1	7.70
K2.5 W03 05.2	4.20
K2.5 W03 05.3	5.20
K2.5 W03 05.4	5.20
K2.5 W03 05.5	6.10
K2.5 W03 05.6	8.20
K2.5 W03 05.7	4.00
K2.5 W03 05.8	7.80
K2.5 W03 05.9	7.40
K2.5 W03 05.10	8.00
K2.5 W03 05.11	7.60
K2.5 W03 05.12	5.80
K2.5 W03 06.1	5.20
K2.5 W03 06.2	5.90
K2.5 W03 06.3	6.40

K2.5 W03 06.4	5.00
K2.5 W03 06.5	5.50
K2.5 W03 06.6	7.20
K2.5 W03 06.7	6.60
K2.5 W03 06.8	7.70
K2.5 W03 06.9	5.80
K2.5 W03 06.10	5.50
K2.5 W03 06.11	5.80
K2.5 W03 06.12	6.10
K2.5 W03 07.1	7.50
K2.5 W03 07.2	7.70
K2.5 W03 07.3	6.50
K2.5 W03 07.4	6.10
K2.5 W03 07.5	6.10
K2.5 W03 07.6	7.20
K2.5 W03 07.7	6.60
K2.5 W03 07.8	6.30
K2.5 W03 07.9	7.90
K2.5 W03 07.10	6.20
K2.5 W03 07.11	5.10
K2.5 W03 07.12	6.30
K2.5 W03 08.1	6.20
K2.5 W03 08.2	5.80
K2.5 W03 08.3	5.10
K2.5 W03 08.4	6.50
K2.5 W03 08.5	6.60
K2.5 W03 08.6	8.80
K2.5 W03 08.7	5.50
K2.5 W03 08.8	5.10
K2.5 W03 08.9	6.70
K2.5 W03 08.10	5.80
K2.5 W03 08.11	6.30
K2.5 W03 08.12	8.60
K2.5 W04 01.1	8.65
K2.5 W04 01.2	9.70
K2.5 W04 01.3	9.85
K2.5 W04 01.4	8.32
K2.5 W04 01.5	8.65
K2.5 W04 01.6	8.39
K2.5 W04 01.7	8.78
K2.5 W04 01.8	8.27
K2.5 W04 01.9	6.86
K2.5 W04 01.10	8.72
K2.5 W04 01.11	8.28
K2.5 W04 01.12	9.81
K2.5 W04 02.1	9.41
K2.5 W04 02.2	8.31
K2.5 W04 02.3	8.83
K2.5 W04 02.4	7.86
K2.5 W04 02.5	7.92
K2.5 W04 02.6	8.14
K2.5 W04 02.7	9.97
K2.5 W04 02.8	7.76
K2.5 W04 02.9	5.99
K2.5 W04 02.10	9.53
K2.5 W04 02.11	7.32
K2.5 W04 02.12	8.01
K2.5 W04 03.1	8.06
K2.5 W04 03.2	6.30
K2.5 W04 03.3	7.83
K2.5 W04 03.4	9.25
K2.5 W04 03.5	8.52
K2.5 W04 03.6	8.56
K2.5 W04 03.7	6.80
K2.5 W04 03.8	7.83
K2.5 W04 03.9	9.09
K2.5 W04 03.10	8.87
K2.5 W04 03.11	8.77
K2.5 W04 03.12	8.24
K2.5 W04 04.1	9.10
K2.5 W04 04.2	8.40
K2.5 W04 04.3	8.23
K2.5 W04 04.4	9.40
K2.5 W04 04.5	9.89
K2.5 W04 04.6	9.62
K2.5 W04 04.7	9.53
K2.5 W04 04.8	8.91
K2.5 W04 04.9	8.49
K2.5 W04 04.10	9.11
K2.5 W04 04.11	7.46
K2.5 W04 04.12	9.08
K2.5 W04 05.1	3.90
K2.5 W04 05.2	4.20
K2.5 W04 05.3	4.50
K2.5 W04 05.4	4.60
K2.5 W04 05.5	5.60
K2.5 W04 05.6	4.20
K2.5 W04 05.7	6.10
K2.5 W04 05.8	5.50
K2.5 W04 05.9	5.80
K2.5 W04 05.10	4.40
K2.5 W04 05.11	3.70
K2.5 W04 05.12	3.50

K2.5 W04 06.1	4.70	**K2.5 W04 07.1**	5.40	**K2.5 W04 08.1**	5.30
K2.5 W04 06.2	6.40	**K2.5 W04 07.2**	6.20	**K2.5 W04 08.2**	4.40
K2.5 W04 06.3	6.60	**K2.5 W04 07.3**	5.60	**K2.5 W04 08.3**	4.90
K2.5 W04 06.4	6.70	**K2.5 W04 07.4**	5.40	**K2.5 W04 08.4**	4.90
K2.5 W04 06.5	6.10	**K2.5 W04 07.5**	5.70	**K2.5 W04 08.5**	5.50
K2.5 W04 06.6	5.70	**K2.5 W04 07.6**	6.20	**K2.5 W04 08.6**	6.10
K2.5 W04 06.7	5.20	**K2.5 W04 07.7**	4.80	**K2.5 W04 08.7**	5.50
K2.5 W04 06.8	6.60	**K2.5 W04 07.8**	5.90	**K2.5 W04 08.8**	4.10
K2.5 W04 06.9	5.10	**K2.5 W04 07.9**	4.90	**K2.5 W04 08.9**	3.50
K2.5 W04 06.10	5.50	**K2.5 W04 07.10**	5.00	**K2.5 W04 08.10**	4.60
K2.5 W04 06.11	5.80	**K2.5 W04 07.11**	5.50	**K2.5 W04 08.11**	6.00
K2.5 W04 06.12	5.40	**K2.5 W04 07.12**	7.10	**K2.5 W04 08.12**	4.80

K = *Kooliner*; **W** = Week

K[CHLORHEXIDINE CONCENTRATION] W[XX] [SPECIMEN].[INDENTATION]

UFI GEL HARD (Voco GmbH, Cuxhaven, Germany)

INDENTATION	KHN
UG0 W01 01.1	8.86
UG0 W01 01.2	8.19
UG0 W01 01.3	9.74
UG0 W01 01.4	8.72
UG0 W01 01.5	8.73
UG0 W01 01.6	9.84
UG0 W01 01.7	10.20
UG0 W01 01.8	9.01
UG0 W01 01.9	8.85
UG0 W01 01.10	9.78
UG0 W01 01.11	9.90
UG0 W01 01.12	8.89
UG0 W01 02.1	11.70
UG0 W01 02.2	7.81
UG0 W01 02.3	7.29
UG0 W01 02.4	9.28
UG0 W01 02.5	8.41
UG0 W01 02.6	8.41
UG0 W01 02.7	9.41
UG0 W01 02.8	7.28
UG0 W01 02.9	9.78
UG0 W01 02.10	9.98
UG0 W01 02.11	7.97
UG0 W01 02.12	9.49
UG0 W01 03.1	9.98
UG0 W01 03.2	9.94
UG0 W01 03.3	9.56
UG0 W01 03.4	9.46
UG0 W01 03.5	8.08
UG0 W01 03.6	9.82

INDENTATION	KHN
UG0 W01 03.7	9.81
UG0 W01 03.8	8.95
UG0 W01 03.9	8.45
UG0 W01 03.10	9.48
UG0 W01 03.11	11.50
UG0 W01 03.12	10.10
UG0 W01 04.1	10.10
UG0 W01 04.2	9.81
UG0 W01 04.3	9.14
UG0 W01 04.4	9.99
UG0 W01 04.5	9.96
UG0 W01 04.6	9.82
UG0 W01 04.7	9.14
UG0 W01 04.8	9.00
UG0 W01 04.9	8.57
UG0 W01 04.10	11.00
UG0 W01 04.11	8.18
UG0 W01 04.12	12.20
UG0 W01 05.1	7.70
UG0 W01 05.2	7.20
UG0 W01 05.3	6.50
UG0 W01 05.4	7.10
UG0 W01 05.5	5.80
UG0 W01 05.6	6.60
UG0 W01 05.7	6.60
UG0 W01 05.8	7.10
UG0 W01 05.9	7.20
UG0 W01 05.10	6.50
UG0 W01 05.11	7.30
UG0 W01 05.12	6.50

INDENTATION	KHN
UG0 W01 06.1	6.40
UG0 W01 06.2	6.30
UG0 W01 06.3	7.90
UG0 W01 06.4	7.00
UG0 W01 06.5	7.20
UG0 W01 06.6	6.90
UG0 W01 06.7	6.60
UG0 W01 06.8	7.40
UG0 W01 06.9	5.80
UG0 W01 06.10	6.60
UG0 W01 06.11	6.50
UG0 W01 06.12	6.80
UG0 W01 07.1	6.10
UG0 W01 07.2	6.80
UG0 W01 07.3	6.70
UG0 W01 07.4	5.70
UG0 W01 07.5	6.60
UG0 W01 07.6	7.00
UG0 W01 07.7	7.20
UG0 W01 07.8	6.30
UG0 W01 07.9	7.00
UG0 W01 07.10	5.90
UG0 W01 07.11	6.20
UG0 W01 07.12	6.90
UG0 W01 08.1	6.60
UG0 W01 08.2	6.60
UG0 W01 08.3	5.20
UG0 W01 08.4	5.80
UG0 W01 08.5	5.90
UG0 W01 08.6	6.00

UG0 W01 08.7	6.40
UG0 W01 08.8	7.20
UG0 W01 08.9	6.60
UG0 W01 08.10	6.10
UG0 W01 08.11	6.50
UG0 W01 08.12	6.10
UG0 W02 01.1	11.90
UG0 W02 01.2	8.72
UG0 W02 01.3	8.79
UG0 W02 01.4	7.86
UG0 W02 01.5	8.18
UG0 W02 01.6	9.26
UG0 W02 01.7	8.42
UG0 W02 01.8	8.46
UG0 W02 01.9	9.12
UG0 W02 01.10	8.52
UG0 W02 01.11	9.61
UG0 W02 01.12	9.41
UG0 W02 02.1	8.74
UG0 W02 02.2	9.43
UG0 W02 02.3	8.71
UG0 W02 02.4	10.50
UG0 W02 02.5	8.85
UG0 W02 02.6	7.89
UG0 W02 02.7	8.46
UG0 W02 02.8	9.58
UG0 W02 02.9	9.20
UG0 W02 02.10	7.63
UG0 W02 02.11	9.23
UG0 W02 02.12	8.82
UG0 W02 03.1	10.10
UG0 W02 03.2	6.60
UG0 W02 03.3	9.29
UG0 W02 03.4	8.94
UG0 W02 03.5	9.80
UG0 W02 03.6	9.08
UG0 W02 03.7	10.40
UG0 W02 03.8	10.00
UG0 W02 03.9	9.19
UG0 W02 03.10	10.30
UG0 W02 03.11	9.61
UG0 W02 03.12	10.60
UG0 W02 04.1	9.00
UG0 W02 04.2	8.79
UG0 W02 04.3	8.56
UG0 W02 04.4	9.29
UG0 W02 04.5	8.32
UG0 W02 04.6	9.28
UG0 W02 04.7	10.20
UG0 W02 04.8	9.32
UG0 W02 04.9	10.10
UG0 W02 04.10	6.86
UG0 W02 04.11	8.27
UG0 W02 04.12	8.62
UG0 W02 05.1	6.20
UG0 W02 05.2	4.90
UG0 W02 05.3	6.70
UG0 W02 05.4	7.10
UG0 W02 05.5	7.90
UG0 W02 05.6	6.20
UG0 W02 05.7	7.00
UG0 W02 05.8	6.30
UG0 W02 05.9	6.50
UG0 W02 05.10	5.40
UG0 W02 05.11	6.80
UG0 W02 05.12	6.60
UG0 W02 06.1	6.10
UG0 W02 06.2	6.50
UG0 W02 06.3	7.80
UG0 W02 06.4	6.50
UG0 W02 06.5	6.50
UG0 W02 06.6	6.10
UG0 W02 06.7	6.40
UG0 W02 06.8	6.00
UG0 W02 06.9	5.80
UG0 W02 06.10	6.60
UG0 W02 06.11	5.90
UG0 W02 06.12	5.80
UG0 W02 07.1	7.60
UG0 W02 07.2	5.90
UG0 W02 07.3	5.70
UG0 W02 07.4	8.00
UG0 W02 07.5	6.50
UG0 W02 07.6	8.40
UG0 W02 07.7	6.30
UG0 W02 07.8	5.60
UG0 W02 07.9	5.90
UG0 W02 07.10	6.50
UG0 W02 07.11	6.20
UG0 W02 07.12	6.70
UG0 W02 08.1	5.70
UG0 W02 08.2	6.60
UG0 W02 08.3	6.30
UG0 W02 08.4	7.00
UG0 W02 08.5	7.00
UG0 W02 08.6	7.50

UG0 W02 08.7	7.80
UG0 W02 08.8	7.00
UG0 W02 08.9	7.60
UG0 W02 08.10	7.40
UG0 W02 08.11	8.40
UG0 W02 08.12	6.30
UG0 W03 01.1	8.91
UG0 W03 01.2	8.75
UG0 W03 01.3	9.01
UG0 W03 01.4	9.17
UG0 W03 01.5	9.11
UG0 W03 01.6	9.39
UG0 W03 01.7	9.94
UG0 W03 01.8	8.19
UG0 W03 01.9	9.97
UG0 W03 01.10	8.28
UG0 W03 01.11	9.16
UG0 W03 01.12	9.59
UG0 W03 02.1	8.06
UG0 W03 02.2	8.57
UG0 W03 02.3	8.81
UG0 W03 02.4	10.10
UG0 W03 02.5	9.46
UG0 W03 02.6	7.97
UG0 W03 02.7	8.30
UG0 W03 02.8	9.04
UG0 W03 02.9	9.48
UG0 W03 02.10	8.47
UG0 W03 02.11	9.08
UG0 W03 02.12	7.70
UG0 W03 03.1	9.10
UG0 W03 03.2	8.26
UG0 W03 03.3	9.03
UG0 W03 03.4	10.30
UG0 W03 03.5	7.54
UG0 W03 03.6	6.77
UG0 W03 03.7	7.93
UG0 W03 03.8	7.82
UG0 W03 03.9	9.54
UG0 W03 03.10	9.22
UG0 W03 03.11	9.89
UG0 W03 03.12	8.62
UG0 W03 04.1	8.75
UG0 W03 04.2	8.12
UG0 W03 04.3	8.51
UG0 W03 04.4	8.98
UG0 W03 04.5	9.08
UG0 W03 04.6	9.20
UG0 W03 04.7	9.45
UG0 W03 04.8	8.58
UG0 W03 04.9	9.70
UG0 W03 04.10	8.83
UG0 W03 04.11	10.50
UG0 W03 04.12	9.24
UG0 W03 05.1	6.10
UG0 W03 05.2	5.60
UG0 W03 05.3	6.30
UG0 W03 05.4	5.90
UG0 W03 05.5	6.10
UG0 W03 05.6	7.00
UG0 W03 05.7	6.30
UG0 W03 05.8	5.30
UG0 W03 05.9	7.40
UG0 W03 05.10	5.60
UG0 W03 05.11	6.40
UG0 W03 05.12	6.40
UG0 W03 06.1	6.70
UG0 W03 06.2	6.50
UG0 W03 06.3	8.10
UG0 W03 06.4	6.40
UG0 W03 06.5	6.70
UG0 W03 06.6	5.70
UG0 W03 06.7	6.70
UG0 W03 06.8	6.40
UG0 W03 06.9	6.70
UG0 W03 06.10	6.60
UG0 W03 06.11	6.50
UG0 W03 06.12	5.80
UG0 W03 07.1	6.80
UG0 W03 07.2	6.00
UG0 W03 07.3	5.70
UG0 W03 07.4	6.30
UG0 W03 07.5	5.30
UG0 W03 07.6	7.40
UG0 W03 07.7	5.60
UG0 W03 07.8	4.70
UG0 W03 07.9	7.70
UG0 W03 07.10	6.60
UG0 W03 07.11	5.00
UG0 W03 07.12	7.80
UG0 W03 08.1	8.30
UG0 W03 08.2	6.70
UG0 W03 08.3	7.20

UG0 W03 08.4	5.70
UG0 W03 08.5	6.00
UG0 W03 08.6	6.70
UG0 W03 08.7	6.20
UG0 W03 08.8	6.90
UG0 W03 08.9	7.00
UG0 W03 08.10	6.80
UG0 W03 08.11	7.30
UG0 W03 08.12	7.20
UG0 W04 01.1	9.02
UG0 W04 01.2	7.70
UG0 W04 01.3	9.90
UG0 W04 01.4	8.87
UG0 W04 01.5	8.82
UG0 W04 01.6	8.72
UG0 W04 01.7	9.35
UG0 W04 01.8	9.21
UG0 W04 01.9	9.46
UG0 W04 01.10	8.54
UG0 W04 01.11	9.87
UG0 W04 01.12	9.20
UG0 W04 02.1	8.67
UG0 W04 02.2	9.08
UG0 W04 02.3	8.54
UG0 W04 02.4	8.04
UG0 W04 02.5	8.25
UG0 W04 02.6	8.38
UG0 W04 02.7	9.95
UG0 W04 02.8	7.36
UG0 W04 02.9	9.25
UG0 W04 02.10	8.54
UG0 W04 02.11	7.29
UG0 W04 02.12	8.30
UG0 W04 03.1	7.43
UG0 W04 03.2	7.94
UG0 W04 03.3	8.81
UG0 W04 03.4	8.39
UG0 W04 03.5	7.61
UG0 W04 03.6	9.67
UG0 W04 03.7	7.98
UG0 W04 03.8	7.86
UG0 W04 03.9	9.29
UG0 W04 03.10	9.24
UG0 W04 03.11	8.19
UG0 W04 03.12	9.31
UG0 W04 04.1	7.90
UG0 W04 04.2	9.18
UG0 W04 04.3	8.64
UG0 W04 04.4	9.76
UG0 W04 04.5	10.00
UG0 W04 04.6	9.16
UG0 W04 04.7	9.44
UG0 W04 04.8	8.21
UG0 W04 04.9	9.36
UG0 W04 04.10	7.98
UG0 W04 04.11	8.30
UG0 W04 04.12	7.80
UG0 W04 05.1	6.70
UG0 W04 05.2	5.50
UG0 W04 05.3	5.60
UG0 W04 05.4	6.80
UG0 W04 05.5	6.60
UG0 W04 05.6	7.40
UG0 W04 05.7	5.70
UG0 W04 05.8	6.30
UG0 W04 05.9	7.60
UG0 W04 05.10	6.40
UG0 W04 05.11	6.30
UG0 W04 05.12	5.90
UG0 W04 06.1	7.30
UG0 W04 06.2	7.60
UG0 W04 06.3	6.10
UG0 W04 06.4	6.60
UG0 W04 06.5	6.80
UG0 W04 06.6	7.50
UG0 W04 06.7	5.90
UG0 W04 06.8	6.90
UG0 W04 06.9	8.40
UG0 W04 06.10	5.80
UG0 W04 06.11	5.50
UG0 W04 06.12	6.30
UG0 W04 07.1	7.50
UG0 W04 07.2	7.10
UG0 W04 07.3	5.00
UG0 W04 07.4	7.20
UG0 W04 07.5	7.80
UG0 W04 07.6	7.00
UG0 W04 07.7	7.20
UG0 W04 07.8	7.50
UG0 W04 07.9	7.60
UG0 W04 07.10	5.50
UG0 W04 07.11	5.30
UG0 W04 07.12	6.60

UG0 W04 08.1	6.60
UG0 W04 08.2	6.50
UG0 W04 08.3	5.20
UG0 W04 08.4	5.20
UG0 W04 08.5	6.00
UG0 W04 08.6	7.20
UG0 W04 08.7	6.30
UG0 W04 08.8	5.90
UG0 W04 08.9	6.60
UG0 W04 08.10	6.60
UG0 W04 08.11	6.30
UG0 W04 08.12	7.10
UG5 W01 01.1	9.74
UG5 W01 01.2	7.91
UG5 W01 01.3	8.48
UG5 W01 01.4	8.54
UG5 W01 01.5	8.66
UG5 W01 01.6	9.33
UG5 W01 01.7	8.44
UG5 W01 01.8	8.69
UG5 W01 01.9	9.01
UG5 W01 01.10	6.60
UG5 W01 01.11	7.88
UG5 W01 01.12	8.56
UG5 W01 02.1	8.64
UG5 W01 02.2	8.40
UG5 W01 02.3	8.23
UG5 W01 02.4	9.78
UG5 W01 02.5	8.18
UG5 W01 02.6	10.60
UG5 W01 02.7	10.50

UG5 W01 02.8	8.08
UG5 W01 02.9	8.58
UG5 W01 02.10	6.25
UG5 W01 02.11	8.79
UG5 W01 02.12	7.26
UG5 W01 03.1	8.20
UG5 W01 03.2	8.40
UG5 W01 03.3	10.00
UG5 W01 03.4	8.24
UG5 W01 03.5	6.98
UG5 W01 03.6	8.43
UG5 W01 03.7	7.86
UG5 W01 03.8	8.84
UG5 W01 03.9	7.96
UG5 W01 03.10	9.40
UG5 W01 03.11	8.71
UG5 W01 03.12	9.43
UG5 W01 04.1	8.70
UG5 W01 04.2	8.72
UG5 W01 04.3	9.90
UG5 W01 04.4	9.68
UG5 W01 04.5	8.98
UG5 W01 04.6	7.62
UG5 W01 04.7	8.62
UG5 W01 04.8	11.40
UG5 W01 04.9	9.50
UG5 W01 04.10	7.77
UG5 W01 04.11	9.96
UG5 W01 04.12	7.76
UG5 W01 05.1	6.10
UG5 W01 05.2	7.00

UG5 W01 05.3	6.90
UG5 W01 05.4	6.60
UG5 W01 05.5	7.80
UG5 W01 05.6	7.00
UG5 W01 05.7	6.40
UG5 W01 05.8	6.80
UG5 W01 05.9	6.40
UG5 W01 05.10	6.60
UG5 W01 05.11	5.90
UG5 W01 05.12	7.30
UG5 W01 06.1	6.90
UG5 W01 06.2	6.30
UG5 W01 06.3	7.10
UG5 W01 06.4	6.90
UG5 W01 06.5	7.20
UG5 W01 06.6	6.70
UG5 W01 06.7	5.60
UG5 W01 06.8	6.60
UG5 W01 06.9	6.70
UG5 W01 06.10	6.10
UG5 W01 06.11	6.40
UG5 W01 06.12	6.20
UG5 W01 07.1	6.60
UG5 W01 07.2	5.70
UG5 W01 07.3	6.60
UG5 W01 07.4	6.30
UG5 W01 07.5	7.90
UG5 W01 07.6	7.90
UG5 W01 07.7	8.00
UG5 W01 07.8	6.40
UG5 W01 07.9	6.70

UG5 W01 07.10	6.60
UG5 W01 07.11	7.10
UG5 W01 07.12	6.30
UG5 W01 08.1	7.00
UG5 W01 08.2	6.70
UG5 W01 08.3	5.80
UG5 W01 08.4	7.60
UG5 W01 08.5	7.80
UG5 W01 08.6	8.40
UG5 W01 08.7	8.00
UG5 W01 08.8	8.80
UG5 W01 08.9	6.50
UG5 W01 08.10	7.00
UG5 W01 08.11	5.50
UG5 W01 08.12	6.00
UG5 W02 01.1	8.93
UG5 W02 01.2	8.12
UG5 W02 01.3	7.71
UG5 W02 01.4	7.35
UG5 W02 01.5	8.61
UG5 W02 01.6	8.66
UG5 W02 01.7	9.14
UG5 W02 01.8	10.00
UG5 W02 01.9	8.79
UG5 W02 01.10	8.28
UG5 W02 01.11	8.80
UG5 W02 01.12	9.79
UG5 W02 02.1	9.32
UG5 W02 02.2	9.39
UG5 W02 02.3	9.33
UG5 W02 02.4	9.11
UG5 W02 02.5	7.84
UG5 W02 02.6	10.00
UG5 W02 02.7	9.51
UG5 W02 02.8	10.00
UG5 W02 02.9	8.71
UG5 W02 02.10	8.24
UG5 W02 02.11	9.45
UG5 W02 02.12	10.00
UG5 W02 03.1	8.40
UG5 W02 03.2	8.70
UG5 W02 03.3	8.53
UG5 W02 03.4	6.99
UG5 W02 03.5	9.10
UG5 W02 03.6	8.80
UG5 W02 03.7	9.24
UG5 W02 03.8	7.64
UG5 W02 03.9	8.60
UG5 W02 03.10	8.51
UG5 W02 03.11	7.25
UG5 W02 03.12	8.27
UG5 W02 04.1	8.77
UG5 W02 04.2	8.58
UG5 W02 04.3	7.97
UG5 W02 04.4	10.20
UG5 W02 04.5	9.49
UG5 W02 04.6	9.46
UG5 W02 04.7	10.10
UG5 W02 04.8	10.00
UG5 W02 04.9	10.50
UG5 W02 04.10	9.05
UG5 W02 04.11	8.63
UG5 W02 04.12	9.55
UG5 W02 05.1	7.00
UG5 W02 05.2	8.40
UG5 W02 05.3	6.70
UG5 W02 05.4	7.10
UG5 W02 05.5	6.30
UG5 W02 05.6	6.60
UG5 W02 05.7	7.60
UG5 W02 05.8	6.60
UG5 W02 05.9	6.80
UG5 W02 05.10	7.00
UG5 W02 05.11	7.90
UG5 W02 05.12	6.80
UG5 W02 06.1	7.10
UG5 W02 06.2	6.40
UG5 W02 06.3	6.80
UG5 W02 06.4	6.80
UG5 W02 06.5	6.40
UG5 W02 06.6	6.60
UG5 W02 06.7	7.60
UG5 W02 06.8	7.60
UG5 W02 06.9	6.50
UG5 W02 06.10	7.90
UG5 W02 06.11	8.30
UG5 W02 06.12	6.60
UG5 W02 07.1	8.00
UG5 W02 07.2	7.20
UG5 W02 07.3	7.00
UG5 W02 07.4	9.10
UG5 W02 07.5	6.40
UG5 W02 07.6	7.80

UG5 W02 07.7	6.60
UG5 W02 07.8	7.40
UG5 W02 07.9	7.20
UG5 W02 07.10	7.00
UG5 W02 07.11	6.10
UG5 W02 07.12	6.40
UG5 W02 08.1	7.50
UG5 W02 08.2	6.50
UG5 W02 08.3	7.70
UG5 W02 08.4	6.20
UG5 W02 08.5	8.80
UG5 W02 08.6	8.40
UG5 W02 08.7	7.60
UG5 W02 08.8	6.90
UG5 W02 08.9	6.90
UG5 W02 08.10	7.40
UG5 W02 08.11	7.70
UG5 W02 08.12	6.60
UG5 W03 01.1	9.88
UG5 W03 01.2	7.84
UG5 W03 01.3	9.01
UG5 W03 01.4	9.01
UG5 W03 01.5	8.73
UG5 W03 01.6	8.33
UG5 W03 01.7	9.54
UG5 W03 01.8	8.99
UG5 W03 01.9	8.76
UG5 W03 01.10	10.10
UG5 W03 01.11	9.50
UG5 W03 01.12	8.05
UG5 W03 02.1	8.14
UG5 W03 02.2	7.14
UG5 W03 02.3	8.63
UG5 W03 02.4	9.30
UG5 W03 02.5	8.99
UG5 W03 02.6	9.12
UG5 W03 02.7	8.67
UG5 W03 02.8	9.70
UG5 W03 02.9	8.28
UG5 W03 02.10	8.18
UG5 W03 02.11	7.46
UG5 W03 02.12	7.90
UG5 W03 03.1	9.14
UG5 W03 03.2	8.08
UG5 W03 03.3	8.50
UG5 W03 03.4	8.48
UG5 W03 03.5	7.48
UG5 W03 03.6	8.95
UG5 W03 03.7	10.00
UG5 W03 03.8	8.20
UG5 W03 03.9	7.99
UG5 W03 03.10	7.30
UG5 W03 03.11	9.35
UG5 W03 03.12	7.33
UG5 W03 04.1	10.80
UG5 W03 04.2	9.66
UG5 W03 04.3	8.94
UG5 W03 04.4	11.00
UG5 W03 04.5	8.10
UG5 W03 04.6	7.14
UG5 W03 04.7	8.71
UG5 W03 04.8	9.41
UG5 W03 04.9	8.77
UG5 W03 04.10	8.88
UG5 W03 04.11	10.60
UG5 W03 04.12	9.88
UG5 W03 05.1	6.50
UG5 W03 05.2	7.20
UG5 W03 05.3	7.40
UG5 W03 05.4	7.00
UG5 W03 05.5	7.00
UG5 W03 05.6	7.80
UG5 W03 05.7	7.40
UG5 W03 05.8	7.00
UG5 W03 05.9	6.80
UG5 W03 05.10	8.00
UG5 W03 05.11	6.40
UG5 W03 05.12	7.10
UG5 W03 06.1	7.80
UG5 W03 06.2	6.80
UG5 W03 06.3	6.30
UG5 W03 06.4	6.70
UG5 W03 06.5	6.90
UG5 W03 06.6	7.30
UG5 W03 06.7	7.50
UG5 W03 06.8	6.30
UG5 W03 06.9	6.60
UG5 W03 06.10	6.70
UG5 W03 06.11	7.20
UG5 W03 06.12	7.20
UG5 W03 07.1	7.90
UG5 W03 07.2	7.00
UG5 W03 07.3	5.50

UG5 W03 07.4	5.60
UG5 W03 07.5	5.80
UG5 W03 07.6	7.10
UG5 W03 07.7	7.10
UG5 W03 07.8	6.20
UG5 W03 07.9	5.40
UG5 W03 07.10	7.10
UG5 W03 07.11	6.20
UG5 W03 07.12	6.70
UG5 W03 08.1	9.30
UG5 W03 08.2	7.10
UG5 W03 08.3	6.20
UG5 W03 08.4	5.90
UG5 W03 08.5	7.10
UG5 W03 08.6	6.90
UG5 W03 08.7	7.30
UG5 W03 08.8	6.80
UG5 W03 08.9	8.40
UG5 W03 08.10	7.50
UG5 W03 08.11	6.30
UG5 W03 08.12	8.60
UG5 W04 01.1	7.21
UG5 W04 01.2	9.39
UG5 W04 01.3	8.26
UG5 W04 01.4	9.73
UG5 W04 01.5	8.68
UG5 W04 01.6	8.68
UG5 W04 01.7	8.59
UG5 W04 01.8	9.08
UG5 W04 01.9	9.20
UG5 W04 01.10	7.36

UG5 W04 01.11	8.25
UG5 W04 01.12	8.10
UG5 W04 02.1	7.08
UG5 W04 02.2	8.40
UG5 W04 02.3	8.22
UG5 W04 02.4	8.32
UG5 W04 02.5	8.30
UG5 W04 02.6	8.14
UG5 W04 02.7	8.37
UG5 W04 02.8	8.77
UG5 W04 02.9	8.38
UG5 W04 02.10	8.92
UG5 W04 02.11	7.88
UG5 W04 02.12	7.86
UG5 W04 03.1	8.77
UG5 W04 03.2	8.03
UG5 W04 03.3	8.05
UG5 W04 03.4	9.25
UG5 W04 03.5	8.56
UG5 W04 03.6	6.96
UG5 W04 03.7	8.69
UG5 W04 03.8	9.84
UG5 W04 03.9	8.07
UG5 W04 03.10	8.31
UG5 W04 03.11	8.85
UG5 W04 03.12	8.27
UG5 W04 04.1	7.56
UG5 W04 04.2	8.76
UG5 W04 04.3	8.33
UG5 W04 04.4	9.56
UG5 W04 04.5	8.53

UG5 W04 04.6	7.95
UG5 W04 04.7	8.42
UG5 W04 04.8	8.83
UG5 W04 04.9	8.07
UG5 W04 04.10	9.15
UG5 W04 04.11	8.72
UG5 W04 04.12	8.31
UG5 W04 05.1	5.90
UG5 W04 05.2	6.70
UG5 W04 05.3	6.80
UG5 W04 05.4	6.80
UG5 W04 05.5	6.60
UG5 W04 05.6	7.10
UG5 W04 05.7	6.80
UG5 W04 05.8	5.50
UG5 W04 05.9	6.60
UG5 W04 05.10	6.10
UG5 W04 05.11	6.80
UG5 W04 05.12	6.30
UG5 W04 06.1	6.30
UG5 W04 06.2	6.50
UG5 W04 06.3	7.20
UG5 W04 06.4	5.80
UG5 W04 06.5	6.80
UG5 W04 06.6	6.00
UG5 W04 06.7	6.70
UG5 W04 06.8	6.90
UG5 W04 06.9	6.50
UG5 W04 06.10	6.10
UG5 W04 06.11	6.20
UG5 W04 06.12	7.50

UG5 W04 07.1	7.00	**UG5 W04 07.9**	6.90	**UG5 W04 08.5**	8.30
UG5 W04 07.2	7.00	**UG5 W04 07.10**	6.70	**UG5 W04 08.6**	6.90
UG5 W04 07.3	6.80	**UG5 W04 07.11**	5.50	**UG5 W04 08.7**	8.70
UG5 W04 07.4	6.20	**UG5 W04 07.12**	6.00	**UG5 W04 08.8**	8.30
UG5 W04 07.5	6.20	**UG5 W04 08.1**	6.90	**UG5 W04 08.9**	7.70
UG5 W04 07.6	7.20	**UG5 W04 08.2**	5.50	**UG5 W04 08.10**	7.20
UG5 W04 07.7	7.70	**UG5 W04 08.3**	7.80	**UG5 W04 08.11**	7.50
UG5 W04 07.8	6.70	**UG5 W04 08.4**	7.00	**UG5 W04 08.12**	8.40

UG = *Ufi Gel Hard*; **W** = Week

UG[CHLORHEXIDINE CONCENTRATION] W[XX] [SPECIMEN].[INDENTATION]

PROBASE COLD (Ivoclar Vivadent AG, Liechtenstein)

INDENTATION	KHN
PC0 W01 01.1	10.70
PC0 W01 01.2	14.30
PC0 W01 01.3	17.10
PC0 W01 01.4	15.90
PC0 W01 01.5	14.80
PC0 W01 01.6	18.30
PC0 W01 01.7	18.10
PC0 W01 01.8	16.80
PC0 W01 01.9	16.00
PC0 W01 01.10	18.90
PC0 W01 01.11	17.30
PC0 W01 01.12	17.80
PC0 W01 02.1	17.30
PC0 W01 02.2	17.80
PC0 W01 02.3	17.20
PC0 W01 02.4	17.20
PC0 W01 02.5	16.60
PC0 W01 02.6	15.90
PC0 W01 02.7	16.30
PC0 W01 02.8	17.50
PC0 W01 02.9	19.50
PC0 W01 02.10	19.90
PC0 W01 02.11	17.90
PC0 W01 02.12	19.30
PC0 W01 03.1	17.20
PC0 W01 03.2	15.60
PC0 W01 03.3	16.30
PC0 W01 03.4	15.00
PC0 W01 03.5	15.10
PC0 W01 03.6	17.70

INDENTATION	KHN
PC0 W01 03.7	15.40
PC0 W01 03.8	16.30
PC0 W01 03.9	15.80
PC0 W01 03.10	15.30
PC0 W01 03.11	17.00
PC0 W01 03.12	17.20
PC0 W01 04.1	17.00
PC0 W01 04.2	14.60
PC0 W01 04.3	15.10
PC0 W01 04.4	15.50
PC0 W01 04.5	15.70
PC0 W01 04.6	16.30
PC0 W01 04.7	18.60
PC0 W01 04.8	15.10
PC0 W01 04.9	16.60
PC0 W01 04.10	15.80
PC0 W01 04.11	17.80
PC0 W01 04.12	18.20
PC0 W01 05.1	12.80
PC0 W01 05.2	13.20
PC0 W01 05.3	11.90
PC0 W01 05.4	11.90
PC0 W01 05.5	12.10
PC0 W01 05.6	12.00
PC0 W01 05.7	11.90
PC0 W01 05.8	12.60
PC0 W01 05.9	10.30
PC0 W01 05.10	11.90
PC0 W01 05.11	12.80
PC0 W01 05.12	11.70

INDENTATION	KHN
PC0 W01 06.1	11.20
PC0 W01 06.2	12.20
PC0 W01 06.3	11.70
PC0 W01 06.4	12.10
PC0 W01 06.5	11.60
PC0 W01 06.6	11.90
PC0 W01 06.7	12.30
PC0 W01 06.8	11.90
PC0 W01 06.9	12.10
PC0 W01 06.10	12.20
PC0 W01 06.11	11.30
PC0 W01 06.12	11.60
PC0 W01 07.1	11.70
PC0 W01 07.2	11.70
PC0 W01 07.3	11.80
PC0 W01 07.4	12.20
PC0 W01 07.5	11.50
PC0 W01 07.6	12.80
PC0 W01 07.7	12.00
PC0 W01 07.8	11.60
PC0 W01 07.9	11.30
PC0 W01 07.10	11.60
PC0 W01 07.11	11.50
PC0 W01 07.12	11.20
PC0 W01 08.1	12.80
PC0 W01 08.2	12.50
PC0 W01 08.3	12.40
PC0 W01 08.4	12.20
PC0 W01 08.5	13.10
PC0 W01 08.6	11.90

PC0 W01 08.7	12.30
PC0 W01 08.8	12.60
PC0 W01 08.9	12.20
PC0 W01 08.10	13.50
PC0 W01 08.11	11.90
PC0 W01 08.12	11.90
PC0 W02 01.1	13.90
PC0 W02 01.2	16.20
PC0 W02 01.3	17.40
PC0 W02 01.4	16.50
PC0 W02 01.5	16.30
PC0 W02 01.6	16.50
PC0 W02 01.7	15.90
PC0 W02 01.8	16.30
PC0 W02 01.9	16.70
PC0 W02 01.10	16.50
PC0 W02 01.11	16.40
PC0 W02 01.12	16.20
PC0 W02 02.1	18.00
PC0 W02 02.2	17.20
PC0 W02 02.3	17.00
PC0 W02 02.4	17.50
PC0 W02 02.5	17.60
PC0 W02 02.6	17.80
PC0 W02 02.7	17.10
PC0 W02 02.8	18.90
PC0 W02 02.9	17.60
PC0 W02 02.10	16.00
PC0 W02 02.11	18.00
PC0 W02 02.12	17.90
PC0 W02 03.1	16.40
PC0 W02 03.2	15.10
PC0 W02 03.3	15.70
PC0 W02 03.4	16.30
PC0 W02 03.5	16.70
PC0 W02 03.6	16.20
PC0 W02 03.7	16.00
PC0 W02 03.8	15.80
PC0 W02 03.9	15.40
PC0 W02 03.10	15.50
PC0 W02 03.11	15.40
PC0 W02 03.12	16.10
PC0 W02 04.1	16.90
PC0 W02 04.2	15.80
PC0 W02 04.3	16.50
PC0 W02 04.4	16.00
PC0 W02 04.5	16.10
PC0 W02 04.6	17.50
PC0 W02 04.7	16.60
PC0 W02 04.8	16.10
PC0 W02 04.9	16.10
PC0 W02 04.10	16.50
PC0 W02 04.11	16.20
PC0 W02 04.12	16.80
PC0 W02 05.1	12.70
PC0 W02 05.2	12.40
PC0 W02 05.3	13.00
PC0 W02 05.4	12.80
PC0 W02 05.5	12.10
PC0 W02 05.6	12.90
PC0 W02 05.7	12.40
PC0 W02 05.8	12.30
PC0 W02 05.9	12.20
PC0 W02 05.10	12.10
PC0 W02 05.11	11.90
PC0 W02 05.12	12.00
PC0 W02 06.1	11.90
PC0 W02 06.2	12.40
PC0 W02 06.3	12.50
PC0 W02 06.4	12.40
PC0 W02 06.5	12.60
PC0 W02 06.6	12.10
PC0 W02 06.7	12.60
PC0 W02 06.8	12.10
PC0 W02 06.9	12.40
PC0 W02 06.10	12.60
PC0 W02 06.11	12.10
PC0 W02 06.12	11.60
PC0 W02 07.1	12.10
PC0 W02 07.2	11.70
PC0 W02 07.3	12.10
PC0 W02 07.4	12.00
PC0 W02 07.5	11.20
PC0 W02 07.6	11.80
PC0 W02 07.7	12.80
PC0 W02 07.8	11.50
PC0 W02 07.9	11.60
PC0 W02 07.10	12.60
PC0 W02 07.11	11.80
PC0 W02 07.12	11.80
PC0 W02 08.1	12.60
PC0 W02 08.2	12.80
PC0 W02 08.3	12.20
PC0 W02 08.4	12.10
PC0 W02 08.5	12.20
PC0 W02 08.6	12.00

PC0 W02 08.7	12.40
PC0 W02 08.8	11.60
PC0 W02 08.9	12.70
PC0 W02 08.10	11.90
PC0 W02 08.11	11.20
PC0 W02 08.12	12.10
PC0 W03 01.1	17.30
PC0 W03 01.2	16.10
PC0 W03 01.3	16.10
PC0 W03 01.4	16.10
PC0 W03 01.5	15.90
PC0 W03 01.6	16.20
PC0 W03 01.7	15.40
PC0 W03 01.8	16.10
PC0 W03 01.9	16.60
PC0 W03 01.10	15.40
PC0 W03 01.11	15.90
PC0 W03 01.12	15.70
PC0 W03 02.1	17.50
PC0 W03 02.2	17.00
PC0 W03 02.3	17.20
PC0 W03 02.4	17.10
PC0 W03 02.5	16.70
PC0 W03 02.6	17.10
PC0 W03 02.7	17.00
PC0 W03 02.8	17.00
PC0 W03 02.9	17.70
PC0 W03 02.10	17.00
PC0 W03 02.11	16.50
PC0 W03 02.12	16.30
PC0 W03 03.1	15.20
PC0 W03 03.2	15.30
PC0 W03 03.3	15.50
PC0 W03 03.4	16.00
PC0 W03 03.5	16.60
PC0 W03 03.6	16.20
PC0 W03 03.7	15.70
PC0 W03 03.8	16.70
PC0 W03 03.9	16.00
PC0 W03 03.10	16.40
PC0 W03 03.11	16.20
PC0 W03 03.12	16.40
PC0 W03 04.1	16.10
PC0 W03 04.2	17.00
PC0 W03 04.3	15.40
PC0 W03 04.4	16.50
PC0 W03 04.5	18.50
PC0 W03 04.6	14.80
PC0 W03 04.7	13.80
PC0 W03 04.8	14.20
PC0 W03 04.9	14.80
PC0 W03 04.10	15.10
PC0 W03 04.11	15.60
PC0 W03 04.12	16.30
PC0 W03 05.1	14.30
PC0 W03 05.2	11.50
PC0 W03 05.3	12.60
PC0 W03 05.4	12.20
PC0 W03 05.5	10.80
PC0 W03 05.6	11.60
PC0 W03 05.7	11.80
PC0 W03 05.8	10.30
PC0 W03 05.9	12.20
PC0 W03 05.10	11.60
PC0 W03 05.11	11.10
PC0 W03 05.12	11.10
PC0 W03 06.1	12.40
PC0 W03 06.2	11.80
PC0 W03 06.3	12.10
PC0 W03 06.4	12.10
PC0 W03 06.5	12.30
PC0 W03 06.6	11.90
PC0 W03 06.7	12.30
PC0 W03 06.8	11.80
PC0 W03 06.9	12.20
PC0 W03 06.10	12.20
PC0 W03 06.11	12.60
PC0 W03 06.12	11.10
PC0 W03 07.1	11.60
PC0 W03 07.2	12.40
PC0 W03 07.3	11.70
PC0 W03 07.4	11.60
PC0 W03 07.5	11.60
PC0 W03 07.6	11.80
PC0 W03 07.7	11.90
PC0 W03 07.8	12.00
PC0 W03 07.9	11.60
PC0 W03 07.10	11.60
PC0 W03 07.11	11.60
PC0 W03 07.12	11.20
PC0 W03 08.1	12.20
PC0 W03 08.2	12.40
PC0 W03 08.3	12.20

PC0 W03 08.4	12.50
PC0 W03 08.5	13.00
PC0 W03 08.6	12.80
PC0 W03 08.7	11.70
PC0 W03 08.8	11.50
PC0 W03 08.9	12.00
PC0 W03 08.10	12.60
PC0 W03 08.11	11.50
PC0 W03 08.12	11.80
PC0 W04 01.1	15.20
PC0 W04 01.2	15.90
PC0 W04 01.3	16.30
PC0 W04 01.4	15.60
PC0 W04 01.5	14.40
PC0 W04 01.6	14.90
PC0 W04 01.7	16.10
PC0 W04 01.8	15.80
PC0 W04 01.9	15.30
PC0 W04 01.10	15.20
PC0 W04 01.11	14.40
PC0 W04 01.12	13.90
PC0 W04 02.1	15.90
PC0 W04 02.2	15.80
PC0 W04 02.3	16.10
PC0 W04 02.4	15.40
PC0 W04 02.5	16.60
PC0 W04 02.6	16.10
PC0 W04 02.7	15.80
PC0 W04 02.8	15.50
PC0 W04 02.9	15.70
PC0 W04 02.10	15.60
PC0 W04 02.11	15.70
PC0 W04 02.12	15.80
PC0 W04 03.1	13.40
PC0 W04 03.2	14.20
PC0 W04 03.3	15.20
PC0 W04 03.4	14.90
PC0 W04 03.5	14.10
PC0 W04 03.6	15.20
PC0 W04 03.7	14.20
PC0 W04 03.8	13.40
PC0 W04 03.9	15.40
PC0 W04 03.10	15.10
PC0 W04 03.11	14.80
PC0 W04 03.12	14.60
PC0 W04 04.1	17.40
PC0 W04 04.2	18.00
PC0 W04 04.3	15.00
PC0 W04 04.4	17.40
PC0 W04 04.5	15.60
PC0 W04 04.6	15.80
PC0 W04 04.7	16.90
PC0 W04 04.8	17.90
PC0 W04 04.9	17.20
PC0 W04 04.10	16.60
PC0 W04 04.11	16.80
PC0 W04 04.12	17.20
PC0 W04 05.1	11.50
PC0 W04 05.2	11.80
PC0 W04 05.3	11.50
PC0 W04 05.4	11.50
PC0 W04 05.5	11.10
PC0 W04 05.6	11.40
PC0 W04 05.7	12.20
PC0 W04 05.8	11.30
PC0 W04 05.9	11.70
PC0 W04 05.10	11.20
PC0 W04 05.11	11.20
PC0 W04 05.12	10.80
PC0 W04 06.1	12.10
PC0 W04 06.2	12.00
PC0 W04 06.3	11.80
PC0 W04 06.4	11.60
PC0 W04 06.5	11.50
PC0 W04 06.6	10.70
PC0 W04 06.7	11.50
PC0 W04 06.8	12.00
PC0 W04 06.9	11.60
PC0 W04 06.10	11.80
PC0 W04 06.11	10.90
PC0 W04 06.12	10.50
PC0 W04 07.1	11.50
PC0 W04 07.2	11.70
PC0 W04 07.3	11.40
PC0 W04 07.4	11.90
PC0 W04 07.5	11.10
PC0 W04 07.6	11.20
PC0 W04 07.7	11.60
PC0 W04 07.8	11.80
PC0 W04 07.9	11.90
PC0 W04 07.10	11.70
PC0 W04 07.11	11.30
PC0 W04 07.12	11.50

PC0 W04 08.1	11.40
PC0 W04 08.2	11.70
PC0 W04 08.3	12.20
PC0 W04 08.4	11.50
PC0 W04 08.5	11.60
PC0 W04 08.6	11.70
PC0 W04 08.7	11.30
PC0 W04 08.8	11.60
PC0 W04 08.9	11.80
PC0 W04 08.10	11.80
PC0 W04 08.11	11.50
PC0 W04 08.12	11.30
PC5 W01 01.1	15.70
PC5 W01 01.2	14.20
PC5 W01 01.3	13.20
PC5 W01 01.4	15.50
PC5 W01 01.5	15.80
PC5 W01 01.6	15.20
PC5 W01 01.7	15.90
PC5 W01 01.8	18.40
PC5 W01 01.9	14.20
PC5 W01 01.10	14.70
PC5 W01 01.11	15.10
PC5 W01 01.12	16.20
PC5 W01 02.1	13.80
PC5 W01 02.2	13.90
PC5 W01 02.3	13.70
PC5 W01 02.4	13.20
PC5 W01 02.5	16.40
PC5 W01 02.6	14.00
PC5 W01 02.7	13.10
PC5 W01 02.8	13.60
PC5 W01 02.9	12.20
PC5 W01 02.10	13.00
PC5 W01 02.11	14.40
PC5 W01 02.12	14.60
PC5 W01 03.1	14.60
PC5 W01 03.2	12.90
PC5 W01 03.3	16.40
PC5 W01 03.4	15.80
PC5 W01 03.5	13.70
PC5 W01 03.6	12.60
PC5 W01 03.7	13.90
PC5 W01 03.8	12.60
PC5 W01 03.9	13.20
PC5 W01 03.10	13.00
PC5 W01 03.11	13.30
PC5 W01 03.12	14.10
PC5 W01 04.1	14.10
PC5 W01 04.2	15.50
PC5 W01 04.3	10.80
PC5 W01 04.4	13.50
PC5 W01 04.5	14.00
PC5 W01 04.6	14.20
PC5 W01 04.7	11.00
PC5 W01 04.8	13.60
PC5 W01 04.9	15.70
PC5 W01 04.10	17.70
PC5 W01 04.11	15.60
PC5 W01 04.12	12.20
PC5 W01 05.1	11.50
PC5 W01 05.2	11.40
PC5 W01 05.3	11.20
PC5 W01 05.4	11.30
PC5 W01 05.5	10.30
PC5 W01 05.6	11.10
PC5 W01 05.7	11.40
PC5 W01 05.8	11.90
PC5 W01 05.9	11.70
PC5 W01 05.10	11.50
PC5 W01 05.11	11.60
PC5 W01 05.12	11.10
PC5 W01 06.1	11.00
PC5 W01 06.2	11.50
PC5 W01 06.3	11.70
PC5 W01 06.4	11.50
PC5 W01 06.5	11.50
PC5 W01 06.6	11.20
PC5 W01 06.7	11.60
PC5 W01 06.8	9.30
PC5 W01 06.9	11.60
PC5 W01 06.10	11.30
PC5 W01 06.11	11.50
PC5 W01 06.12	11.40
PC5 W01 07.1	11.60
PC5 W01 07.2	11.10
PC5 W01 07.3	11.40
PC5 W01 07.4	10.80
PC5 W01 07.5	11.20
PC5 W01 07.6	10.60
PC5 W01 07.7	11.70
PC5 W01 07.8	11.20
PC5 W01 07.9	12.00

PC5 W01 07.10	10.90
PC5 W01 07.11	10.70
PC5 W01 07.12	10.70
PC5 W01 08.1	11.70
PC5 W01 08.2	12.00
PC5 W01 08.3	11.50
PC5 W01 08.4	11.90
PC5 W01 08.5	11.80
PC5 W01 08.6	11.30
PC5 W01 08.7	11.70
PC5 W01 08.8	11.60
PC5 W01 08.9	11.30
PC5 W01 08.10	10.20
PC5 W01 08.11	11.60
PC5 W01 08.12	11.30
PC5 W02 01.1	14.10
PC5 W02 01.2	15.20
PC5 W02 01.3	15.10
PC5 W02 01.4	14.20
PC5 W02 01.5	14.50
PC5 W02 01.6	14.30
PC5 W02 01.7	15.40
PC5 W02 01.8	15.30
PC5 W02 01.9	15.80
PC5 W02 01.10	16.00
PC5 W02 01.11	15.20
PC5 W02 01.12	13.40
PC5 W02 02.1	13.30
PC5 W02 02.2	14.70
PC5 W02 02.3	13.70
PC5 W02 02.4	13.10
PC5 W02 02.5	14.50
PC5 W02 02.6	14.50
PC5 W02 02.7	13.20
PC5 W02 02.8	14.50
PC5 W02 02.9	14.90
PC5 W02 02.10	13.40
PC5 W02 02.11	14.90
PC5 W02 02.12	14.90
PC5 W02 03.1	13.20
PC5 W02 03.2	11.10
PC5 W02 03.3	13.70
PC5 W02 03.4	10.90
PC5 W02 03.5	14.80
PC5 W02 03.6	14.10
PC5 W02 03.7	14.10
PC5 W02 03.8	16.20
PC5 W02 03.9	14.60
PC5 W02 03.10	13.80
PC5 W02 03.11	16.90
PC5 W02 03.12	14.60
PC5 W02 04.1	17.60
PC5 W02 04.2	14.00
PC5 W02 04.3	11.80
PC5 W02 04.4	15.90
PC5 W02 04.5	13.30
PC5 W02 04.6	11.30
PC5 W02 04.7	14.30
PC5 W02 04.8	14.40
PC5 W02 04.9	15.70
PC5 W02 04.10	14.00
PC5 W02 04.11	13.40
PC5 W02 04.12	13.40
PC5 W02 05.1	11.50
PC5 W02 05.2	11.90
PC5 W02 05.3	12.10
PC5 W02 05.4	11.40
PC5 W02 05.5	11.80
PC5 W02 05.6	11.40
PC5 W02 05.7	12.00
PC5 W02 05.8	11.50
PC5 W02 05.9	11.60
PC5 W02 05.10	11.20
PC5 W02 05.11	11.60
PC5 W02 05.12	12.30
PC5 W02 06.1	12.50
PC5 W02 06.2	11.40
PC5 W02 06.3	11.40
PC5 W02 06.4	11.50
PC5 W02 06.5	12.00
PC5 W02 06.6	12.10
PC5 W02 06.7	11.80
PC5 W02 06.8	10.60
PC5 W02 06.9	11.00
PC5 W02 06.10	11.40
PC5 W02 06.11	11.60
PC5 W02 06.12	11.30
PC5 W02 07.1	11.20
PC5 W02 07.2	11.90
PC5 W02 07.3	11.40
PC5 W02 07.4	10.30
PC5 W02 07.5	12.10
PC5 W02 07.6	11.80

PC5 W02 07.7	11.50
PC5 W02 07.8	10.60
PC5 W02 07.9	11.10
PC5 W02 07.10	11.50
PC5 W02 07.11	11.70
PC5 W02 07.12	11.70
PC5 W02 08.1	12.20
PC5 W02 08.2	12.10
PC5 W02 08.3	11.00
PC5 W02 08.4	11.40
PC5 W02 08.5	11.20
PC5 W02 08.6	11.10
PC5 W02 08.7	11.90
PC5 W02 08.8	11.80
PC5 W02 08.9	11.80
PC5 W02 08.10	11.90
PC5 W02 08.11	11.60
PC5 W02 08.12	11.30
PC5 W03 01.1	13.70
PC5 W03 01.2	13.30
PC5 W03 01.3	13.20
PC5 W03 01.4	13.80
PC5 W03 01.5	14.70
PC5 W03 01.6	13.70
PC5 W03 01.7	12.70
PC5 W03 01.8	13.30
PC5 W03 01.9	13.80
PC5 W03 01.10	12.00
PC5 W03 01.11	14.10
PC5 W03 01.12	14.50
PC5 W03 02.1	13.00
PC5 W03 02.2	11.80
PC5 W03 02.3	12.20
PC5 W03 02.4	13.30
PC5 W03 02.5	13.20
PC5 W03 02.6	12.70
PC5 W03 02.7	11.70
PC5 W03 02.8	13.30
PC5 W03 02.9	12.30
PC5 W03 02.10	12.90
PC5 W03 02.11	12.50
PC5 W03 02.12	12.10
PC5 W03 03.1	12.90
PC5 W03 03.2	13.70
PC5 W03 03.3	15.20
PC5 W03 03.4	14.70
PC5 W03 03.5	14.80
PC5 W03 03.6	14.20
PC5 W03 03.7	14.40
PC5 W03 03.8	14.90
PC5 W03 03.9	11.60
PC5 W03 03.10	14.60
PC5 W03 03.11	14.70
PC5 W03 03.12	13.50
PC5 W03 04.1	11.80
PC5 W03 04.2	11.10
PC5 W03 04.3	13.80
PC5 W03 04.4	13.60
PC5 W03 04.5	13.20
PC5 W03 04.6	13.20
PC5 W03 04.7	13.00
PC5 W03 04.8	14.00
PC5 W03 04.9	12.80
PC5 W03 04.10	12.20
PC5 W03 04.11	13.10
PC5 W03 04.12	14.20
PC5 W03 05.1	12.50
PC5 W03 05.2	12.10
PC5 W03 05.3	11.50
PC5 W03 05.4	11.90
PC5 W03 05.5	13.40
PC5 W03 05.6	8.50
PC5 W03 05.7	11.00
PC5 W03 05.8	12.60
PC5 W03 05.9	11.90
PC5 W03 05.10	12.00
PC5 W03 05.11	12.10
PC5 W03 05.12	11.90
PC5 W03 06.1	12.70
PC5 W03 06.2	11.60
PC5 W03 06.3	11.00
PC5 W03 06.4	11.40
PC5 W03 06.5	10.60
PC5 W03 06.6	10.50
PC5 W03 06.7	11.40
PC5 W03 06.8	10.50
PC5 W03 06.9	11.10
PC5 W03 06.10	11.50
PC5 W03 06.11	11.20
PC5 W03 06.12	11.20
PC5 W03 07.1	12.10
PC5 W03 07.2	11.80
PC5 W03 07.3	11.40

PC5 W03 07.4	12.10
PC5 W03 07.5	11.90
PC5 W03 07.6	11.60
PC5 W03 07.7	12.10
PC5 W03 07.8	11.90
PC5 W03 07.9	12.70
PC5 W03 07.10	11.70
PC5 W03 07.11	12.20
PC5 W03 07.12	11.90
PC5 W03 08.1	11.80
PC5 W03 08.2	11.80
PC5 W03 08.3	11.00
PC5 W03 08.4	11.60
PC5 W03 08.5	10.60
PC5 W03 08.6	11.40
PC5 W03 08.7	11.80
PC5 W03 08.8	11.00
PC5 W03 08.9	11.90
PC5 W03 08.10	11.80
PC5 W03 08.11	10.00
PC5 W03 08.12	11.50
PC5 W04 01.1	14.10
PC5 W04 01.2	16.10
PC5 W04 01.3	17.80
PC5 W04 01.4	16.80
PC5 W04 01.5	16.10
PC5 W04 01.6	15.60
PC5 W04 01.7	15.20
PC5 W04 01.8	16.70
PC5 W04 01.9	15.30
PC5 W04 01.10	15.80
PC5 W04 01.11	15.70
PC5 W04 01.12	11.00
PC5 W04 02.1	14.80
PC5 W04 02.2	13.50
PC5 W04 02.3	14.90
PC5 W04 02.4	14.50
PC5 W04 02.5	17.10
PC5 W04 02.6	12.50
PC5 W04 02.7	13.70
PC5 W04 02.8	15.30
PC5 W04 02.9	14.90
PC5 W04 02.10	12.90
PC5 W04 02.11	14.60
PC5 W04 02.12	14.00
PC5 W04 03.1	14.60
PC5 W04 03.2	13.70
PC5 W04 03.3	15.60
PC5 W04 03.4	15.40
PC5 W04 03.5	16.00
PC5 W04 03.6	14.00
PC5 W04 03.7	15.00
PC5 W04 03.8	15.20
PC5 W04 03.9	15.80
PC5 W04 03.10	15.30
PC5 W04 03.11	14.60
PC5 W04 03.12	13.80
PC5 W04 04.1	13.30
PC5 W04 04.2	12.20
PC5 W04 04.3	13.80
PC5 W04 04.4	12.50
PC5 W04 04.5	13.70
PC5 W04 04.6	14.30
PC5 W04 04.7	12.50
PC5 W04 04.8	14.20
PC5 W04 04.9	15.10
PC5 W04 04.10	14.50
PC5 W04 04.11	14.50
PC5 W04 04.12	15.20
PC5 W04 05.1	9.80
PC5 W04 05.2	11.20
PC5 W04 05.3	10.90
PC5 W04 05.4	11.00
PC5 W04 05.5	11.00
PC5 W04 05.6	11.30
PC5 W04 05.7	11.20
PC5 W04 05.8	10.80
PC5 W04 05.9	11.80
PC5 W04 05.10	11.10
PC5 W04 05.11	11.10
PC5 W04 05.12	10.50
PC5 W04 06.1	11.00
PC5 W04 06.2	11.00
PC5 W04 06.3	10.80
PC5 W04 06.4	11.40
PC5 W04 06.5	10.30
PC5 W04 06.6	10.50
PC5 W04 06.7	11.30
PC5 W04 06.8	11.00
PC5 W04 06.9	11.50
PC5 W04 06.10	10.40
PC5 W04 06.11	10.30
PC5 W04 06.12	10.50

PC5 W04 07.1	10.40	**PC5 W04 07.9**	10.70	**PC5 W04 08.5**	11.10
PC5 W04 07.2	10.40	**PC5 W04 07.10**	10.90	**PC5 W04 08.6**	11.00
PC5 W04 07.3	10.50	**PC5 W04 07.11**	10.70	**PC5 W04 08.7**	11.20
PC5 W04 07.4	10.60	**PC5 W04 07.12**	11.50	**PC5 W04 08.8**	10.90
PC5 W04 07.5	10.60	**PC5 W04 08.1**	11.20	**PC5 W04 08.9**	8.60
PC5 W04 07.6	9.40	**PC5 W04 08.2**	11.00	**PC5 W04 08.10**	10.40
PC5 W04 07.7	10.50	**PC5 W04 08.3**	11.00	**PC5 W04 08.11**	11.80
PC5 W04 07.8	10.20	**PC5 W04 08.4**	11.10	**PC5 W04 08.12**	11.50

PC = *Probase Cold*; **W** = Week

PC[CHLORHEXIDINE CONCENTRATION] W[XX] [SPECIMEN].[INDENTATION]

APPENDIX 03 – EXPERIMENTAL DATA | FLEXURAL STRENGTH

KOOLINER (GC America Inc., Alsip, IL., USA)

CHX CONCENTRATION	SPECIMEN	LOAD AT YIELD [KN]	WIDTH [mm]	THICKNESS [mm]	FLEXURAL STRENGTH [MPa]
0.00%	**01**	0.0596	10.03	3.04	48.22357719
	02	0.0622	10.00	3.00	51.83333333
	03	0.0598	10.12	3.17	44.10252049
	04	0.0669	10.01	3.11	51.82419033
	05	0.0455	10.03	3.11	35.17636419
	06	0.0351	9.92	2.95	30.49387922
	07	0.0514	10.05	3.15	38.65780696
	08	0.0505	10.18	3.05	39.99495245

CHX CONCENTRATION	SPECIMEN	LOAD AT YIELD [KN]	WIDTH [mm]	THICKNESS [mm]	FLEXURAL STRENGTH [MPa]
2.50%	**01**	0.0609	10.28	3.10	46.23406228
	02	0.0685	10.17	3.08	53.25120614
	03	0.0668	10.33	3.10	50.46775856
	04	0.0683	10.29	3.22	48.01255845
	05	0.0458	10.07	3.22	32.89921439
	06	0.0503	10.14	3.13	37.97542285
	07	0.0504	10.18	3.16	37.18517730
	08	0.0494	10.25	3.13	36.89569299

UFI GEL HARD (Voco GmbH, Cuxhaven, Germany)

CHX CONCENTRATION	SPECIMEN	LOAD AT YIELD [KN]	WIDTH [mm]	THICKNESS [mm]	FLEXURAL STRENGTH [MPa]
0.00%	**01**	0.0611	10.02	3.16	45.79948419
	02	0.0486	10.15	3.22	34.63536327
	03	0.0492	10.26	3.25	34.04962109
	04	0.0500	10.20	3.22	35.45841777
	05	0.0534	10.27	3.22	37.61147223
	06	0.0563	10.04	3.18	41.58930907
	07	0.0440	10.19	3.16	32.43139208
	08	0.0505	10.16	3.13	38.05136656

CHX CONCENTRATION	SPECIMEN	LOAD AT YIELD [KN]	WIDTH [mm]	THICKNESS [mm]	FLEXURAL STRENGTH [MPa]
5.00%	**01**	0.0554	10.12	3.15	41.37799169
	02	0.0371	10.22	3.14	27.61372408
	03	0.0531	10.30	3.25	36.60596312
	04	0.0532	10.31	3.20	37.79325291
	05	0.0581	10.17	3.19	42.10513622
	06	0.0502	10.15	3.20	36.22421490
	07	0.0508	10.10	3.19	37.06997010
	08	0.0569	10.05	3.14	43.06735219

PROBASE COLD (Ivoclar Vivadent AG, Liechtenstein)

CHX CONCENTRATION	SPECIMEN	LOAD AT YIELD [KN]	WIDTH [mm]	THICKNESS [mm]	FLEXURAL STRENGTH [MPa]
0.00%	**01**	0.1365	10.21	3.28	93.20098135
	02	0.1044	10.57	3.25	70.13261827
	03	0.0834	10.23	2.57	92.57323353
	04	0.0987	10.45	2.83	88.44825204
	05	0.1142	10.06	3.27	79.62214648
	06	0.1273	10.12	3.29	87.16002751
	07	0.0925	10.11	2.80	87.52573730
	08	0.0665	10.01	2.92	58.43635629

CHX CONCENTRATION	SPECIMEN	LOAD AT YIELD [KN]	WIDTH [mm]	THICKNESS [mm]	FLEXURAL STRENGTH [MPa]
5.00%	**01**	0.1063	10.18	3.49	64.29776781
	02	0.0907	10.57	3.23	61.68627114
	03	0.1014	10.02	3.22	73.20146174
	04	0.1014	10.15	3.31	68.38757256
	05	0.1117	10.13	3.41	71.12073450
	06	0.0675	10.16	2.73	66.85686901
	07	0.0820	10.31	3.15	60.11672909
	08	0.0964	10.24	3.42	60.36512837